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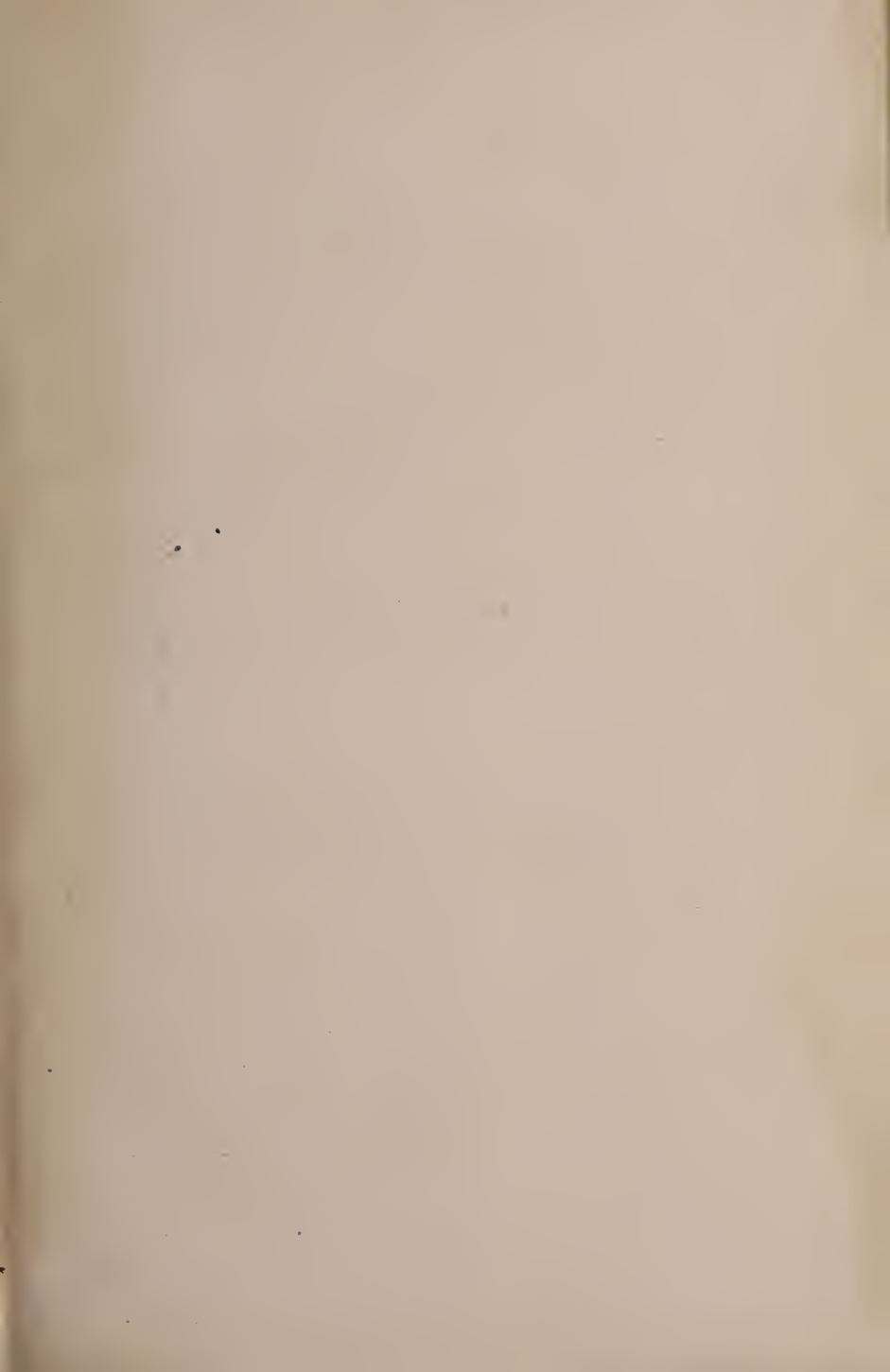
OF THE

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PRINCETON, N. J.

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I Society of Bengal



JOURNAL
OF THE
ASIATIC SOCIETY OF BENGAL,

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THE SECRETARIES.

VOL. XVI.

PART II.—JULY TO DECEMBER, 1847.

“ It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science, in different parts of Asia will commit their observations to writing, and send them to the Asiatic Society at Calcutta. It will languish if such communications shall be long intermitted, and it will die away if they shall entirely cease.”—SIR WM. JONES.

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JOURNAL
OF THE
ASIATIC SOCIETY.

AUGUST, 1847.

*Notes on the Antiquities of the Districts within the Bhopal Agency,
&c. by Capt. J. D. CUNNINGHAM, Engineers, Political Agent,
Bhopal.*

I send you two packages of inscriptions, copied during a tour of the districts within the Bhopal Agency, which I have just completed. I trust that they may reach you in safety, and that the few I have set apart from the rest may be deemed worthy of publication.

The existence of a "Tope" near Bhilsa was known to myself as to others through the medium of the Asiatic Society's Journal, but as I had not the book by me at the time, I was not prepared to find so interesting and valuable a monument as I conceive this Tope to present. The whole country moreover, on either side of the upper Betwah and North and South of Bhilsa, is full of antiquities, and I am glad that I have had an opportunity of bringing some of these relics to your notice.

In describing the localities, or the buildings, or the monuments, which have furnished the several inscriptions, I may indulge in some speculation, and it is therefore but candid, although it is hardly necessary, to remind you of my want of scholarship and indeed of any deficiencies in every way, excepting, perhaps, in a proper degree of interest in the history of the country and of the creeds which its inhabitants have professed. My lucubrations however will not take long to read, and they may be suggestive to others.

Bhojpoor.—I will first refer to Bhojpoor as the most southerly, or as being higher up the river Betwah than the other places. Raja Bhoj, of the Powâr or "Puar" tribe, whose date or identity is doubtful, is however believed to have represented both the race and the power of Vieramaditya, and in this part of Malwa he is generally considered to have flourished in the fifth century of our era. The legend related by Sir John Malcolm (*Central India*, I. 25) is also in every one's mouth, viz: that in order to mark his gratitude or his love, or to expiate the sacrifice voluntarily made by his mother of her own life in giving him birth, he was always bent upon accomplishing some good work, and that the brahmins prescribed the erection of an embankment which should arrest nine rivers and ninety-nine rivulets, probably with the view of providing irrigation for a tract of country lower down the river. A place was chosen close to where two of the main branches of the infant Betwah unite in order to pass through a narrow gorge about 18 miles to the south-east of Bhopal. The gorge in question was dammed across, as was likewise a hollow to the westward of the outlet. A large lake, or *Thâl*, was thus formed, which inclosed a low range of hillocks, still distinguished as "the Island" by the name of its present village "Deep" (*Dwîpa*). The lake would appear to have been sixteen or seventeen miles in length and about seven or eight miles in breadth, but after all the care and labour which had been expended, it was found that one stream was still wanting to complete the full number, and Bhopal, the Minister of the King, suggested the embankment of a ravine at the spot on which the city called after him now stands. By this means a considerable rivulet which rises south-west of Bhopal, was made to run south-easterly into the Betwah or into the newly formed lake, instead of north-easterly into the river at Bhilsa, as until that time it had done. It is to this day apparent that the rivulet in question has been forced from its original channel, and it forms now the real Betwah. The lake continued to exist until the erection of Malwa into a kingdom by the Affghan Ghorees in the 14th and 15th centuries, when it is related that Sooltan Hoshung lamented the loss of so much good land, and ordered the embankment across the Betwah to be destroyed. According to the common belief 360 villages now fill the bed of the lake of Raja Bhoj, and it is certain that the tract in question is one of the most fertile in Bhopal.

The remains of the embankment across the Betwah, show that it may have been about a hundred feet in height and perhaps three hundred yards in length at the top. The dam across the hollow is scarcely a mile in length, so that the place selected was in every way well adapted for the object in view. The artificial part of this dam may be about 30 feet high where most lofty, and it forms a roadway from fifty to sixty feet in width. The embankment at Bhopal still serves its original purpose. All three have been formed of a mass of rocks and earth heaped together, and faced with blocks of stone from 3 to 6 feet long by 2 or 3 feet wide and $1\frac{1}{2}$ to $2\frac{1}{2}$ feet thick, laid so as to form a considerable angle and to present a sloping surface on either side. The work looks gigantic, and although the sandstone blocks were procurable on the spot, the prodigality of labour bestowed, shows rather the material power of the prince than the scientific poverty of his engineers. To the careless observer the whole work may appear to be one of the many idle acts of which despotism has been guilty, and yet I imagine that among the ancients of Asia as of Europe, more simplicity of mind and singleness of object prevailed than among the moderns of either continent. I doubt not that Raja Bhoj's labourers and mechanics sympathized with the motives of their prince, and readily presented themselves to execute a work, which may have conveyed some religious merit even to them, and which it is more than likely the Raja commenced with his own hands while he exhorted the workmen to persevere by personal attentions and occasional donations.

Malcolm had heard that Raja Bhoj built a city on the banks of his lake, but it does not appear that he designed more than the erection of a temple, which was begun, but has never been completed. The temple stands on the hill at the southern end of the dam across the Betwah; it is surrounded by the houses of a small village called Bhojpoor, but the only other remains, are some rude shrines dedicated to modern divinities, a plain Jain temple containing a figure of Parisnath, about 20 feet high, and the remains of the foundations of slight walls showing the square outline of a building never completed or nearly obliterated.

The temple of Raja Bhoj is dedicated to Shiv or Mahadeo. Its base forms a square of about 62 feet, and it may be nearly as many feet in height. The external walls are about 10 feet thick, and the unfinished dome of elaborate workmanship, is supported by four pillars, probably

40 feet high. The entrance is on the western side, and you ascend to the door lintel and then descend into the temple. The passages between the massive pillars and the external walls are necessarily narrow, and the pillars themselves are inelegant in their proportions. The space between them is wholly occupied with the "Lingam," which, with its pedestal, forms a gigantic object nearly 25 feet high, and is an existing illustration of a passage in Wilson's Hindoo Theatre, to the effect, if my memory serves me right, that the "Saivas" had a god so big they were obliged first to build *him* and then his containing temple.

The Lingam with its sustaining altar or pedestal, has an elegant and imposing appearance. The Lingam proper is a cylinder, with a slightly rounded top, of 7 feet and 2 inches in height by 5 feet 3 inches in diameter. It rests upon a single block 19½ feet square by 3¼ feet in thickness, the upper surface having a channel parallel to the four edges, to carry off the water of oblations. The "die" or body of the pedestal or altar is about seven feet square in section, but the accompanying elevation, drawn partly from memory, will give you a truer idea of the whole work than any description, although it cannot be quite accurate in details, and the proportions are certainly not so perfect in the drawing as I conceive them to be in the original. The pedestals of many Lingams are indeed almost faultless in their proportions and in the beauty of their ornaments, and at Bhojpoor greatness of dimension is added to perfection of form.

The temple was never completed, and partially hewn stones, or blocks rough as they were quarried, are still lying on the summit of the sandstone hill within three hundred yards of the building. One of these blocks is the half wrought "Kullus" or keystone of the dome, which measures eleven feet square by five feet in thickness. A ramp of earth and rubbish abutting against the eastern side of the temple still remains, to show the simple and efficient, if not very ingenious means, used for raising heavy blocks to the summits of buildings.

No formal inscription has been found, and as the temple was never finished it is probable that none was ever recorded. The inscription in five lines, now sent, is cut on the jamb of the doorway, and is probably the work of some pilgrim. The characters, although rudely executed and somewhat different in form from those now in use, are still legible, but the language is not understood by any Pundit in this quarter. You

will observe that two dates occur in the inscription, the first "159" and the second "136," and as in bad or hasty writing, an Indian "seven" resembles a "one," I mention particularly that in reading the original this similarity has been held in view. The two inscriptions on the step and lintel of the doorway do not seem to be deserving of any notice.

On the pedestal of the Lingam are cut in well formed letters, the Sanserit words "*achinted deoj*" signifying "*the sign of the Incomprehensible*,"* of which a transcript will be found among the inscriptions. It seems to me that this short sentence should teach us much, and I have long thought that "Saivism" may yet be found to have once been, if it is not now, purer and more simple faith than is commonly supposed. I would discard a Phallic correspondence and all recondite regenerative meanings, as showing subsequent constructions rather than original design or import.† The peasantry of the wilder parts of India, still use a smooth pebble, or rounded blocks as the mark of the Divinity, or rather as a point of direction to their senses, and they will draw a trench round it on its sustaining altar of stone or tempered earth, to let their oblations of water run freely away, without even considering that they had formed or were worshipping the symbols of reproductive energy. "Ling" in its primitive acceptation means merely, a sign, a mark, and so little do the mass of worshippers know of what we consider its philosophic import, and so dull are their minds or so gross has their idolatry become, that in these days the plain pillar must often be shrouded in a case representing a human countenance, to convince them more certainly of the existence or place of the God. When the Brahmins quitted the Ganges, such of the tribes of Southern India as were not wholly barbarous, probably professed one form or other of Buddhism, with its ceremonies, and its images, and its indistinct apprehensions of a Divinity, and the new conquerors, may we call them Unitarians or

* These words have been separately read by another person as *achuteddeoj* or "the mark of the everlasting God." There is little difference in the writing and none in the meaning so far as regards the argument in the text.

[The inscription on the Lingam is अचिन्त्याध्वज, *Achintya dhwa*; and on the right jamb of the door, इरा श्रीमाधवसुतजीकुं प्रणमति "Salutation to the son of Madhab." —Eds.]

† Did an Athenian Magistrate or a Roman Matron, think of "*phalloi*" as emblems of fecundity or of reproduction, when the one allowed them to be borne through the streets during Dionysian festivals, or when the other tied them round the necks of her children as charms against evil?

only Monotheists? perhaps endeavoured to purify the faith of the learned by insisting on the existence of a God, and to sublime or exalt the superstition of the multitude by substituting a simple sign or mark for the representations of men and beasts, or by teaching the mere "Fetichists," that their plain black stone or block of wood, should lead them to think of the invisible ruler of the universe. I would thus regard "Vedantism" as the philosophical, and "Saivism" as the political or social, the theologic or theogonic, aspect of the genius of Brahminism. The worship of Kalce, or "Saktism" in general, similarly marks the superstitious phase of the old Hindoo mind, for the rude still every where propitiate the dread Goddess of famine, pestilence, and death, while I would regard the Vaishnavee sect as representing the compromise of Brahmanism with Buddhism of the unity of God with the multiplicity of his powers and the variety of his aspects. This view admits of a civilization of the Southern and Western Coasts of India, and of the existence of a consanguineous race from the Ghats to the Himalayas, before the rise of the Brahmins, who with their warlike Kshutrees may have originally emigrated from Central Asia, but who during a long sojourn on the banks of the Ganges, had a form and direction given to their latent energies which made them the Greeks of the East, the Achæans of the wide spread Pelasgians of India, and which also rendered their civilization eminently national and characteristic. Buddhism may have been imported or adopted from Egypt and Babylon, but Vedantism is the native product of the mind of the dwellers on the Ganges with some intermixture of Mithraic traditions.

Raeesén.—Raeesén is a double-walled fort standing on a hill nearly isolated, and situated between Bhojpoor and Bhilsa. It was formerly the possession of a Tooer Rajpoot family of some local repute. Baber proposed marching against it, Akber made it the head-quarters of a "Sircar" or Zillah, but Aurungzeb afterwards removed the establishments to Bhilsa. Neither the Hindoo nor the Mahometan buildings are of great extent or merit, neither does the inscription appear to establish any thing of moment, although the date 1582 Sumbut serves to show the degree to which power had there been recovered by the Hindoos of Malwa.

Bhilsa.—Bhilsa is situated about half a mile from the right bank of the Betwah or Behterwantee River. Its ancient name is stated to have

been Bhudrawat, and it is related that the Pandoos gave battle to the then Raja, in order that they might obtain the white horse with the black ear to enable them to perform the "Uswoomed" sacrifice and to challenge the supremacy of India. The horse was stabled upon the precipitous rock of "Lohanghee" to the eastward of the town, and the Lord of Bhilsa had to yield it to his conquerors. On the opposite bank of the Betwah is still to be seen the site of a town known as Beismggur, and there is still a tribe in this part of India called the Beis or Beius, which claims to be Rajpoot. The present walls of Bhilsa are said to have been built by a Bheel Chief, and the name may possibly show it to have been the seat of a tribe, which has been pushed further to the westward within the historical period.

Bhilsa itself contains one edifice only of any note, viz : a mosque of rude workmanship built on the site of a "Beeja (Vijaya) Mandur" destroyed by Aurangzeb. From the fragments or portions of this temple which are still visible it would appear to have been a very elaborate work. The mosque is only curious, as a building, from its two minarets which are each formed by clustering together four pillars of irregular bases so as to form upon the whole two sides of a square in plan. The minarets are nearly destroyed, and the building suffered somewhat during the Mahratta wars from the ill directed fire of Ameer Khan's cannon. The inscription which accompanies this, is to be seen on a stone built into the wall of a narrow passage.*

The "Topes" near Bhilsa.—The "Topes" and other Buddhist remains at Satehah Kanehkhara about $4\frac{1}{2}$ miles to the south-west of Bhilsa, are however the monuments which give to that place its chief antiquarian interest. To these may be added the "Topes" at Peepleea, Bijolee, six or seven miles south-east from the two and the Vaishnav-vee sculptures at Oodeghir about a mile and a half west of Bhilsa and nearly double that distance north of the Satehah "Topes"

The two Topes at Satehah were visited in 1819 by Captain Fell, [see Journ. As. Soc. for 1834, p. 488, &c.], when they were in better preservation than they are now, for an opinion confidently expressed by that officer, that they contained chambers or were not solid, led to two attempts to excavate them on the part of amateurs or antiquaries.

* The words of the Inscription are read, but the language is not understood, by the Puudis here; some terms or words seem to be pure Sanserit.

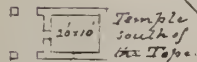
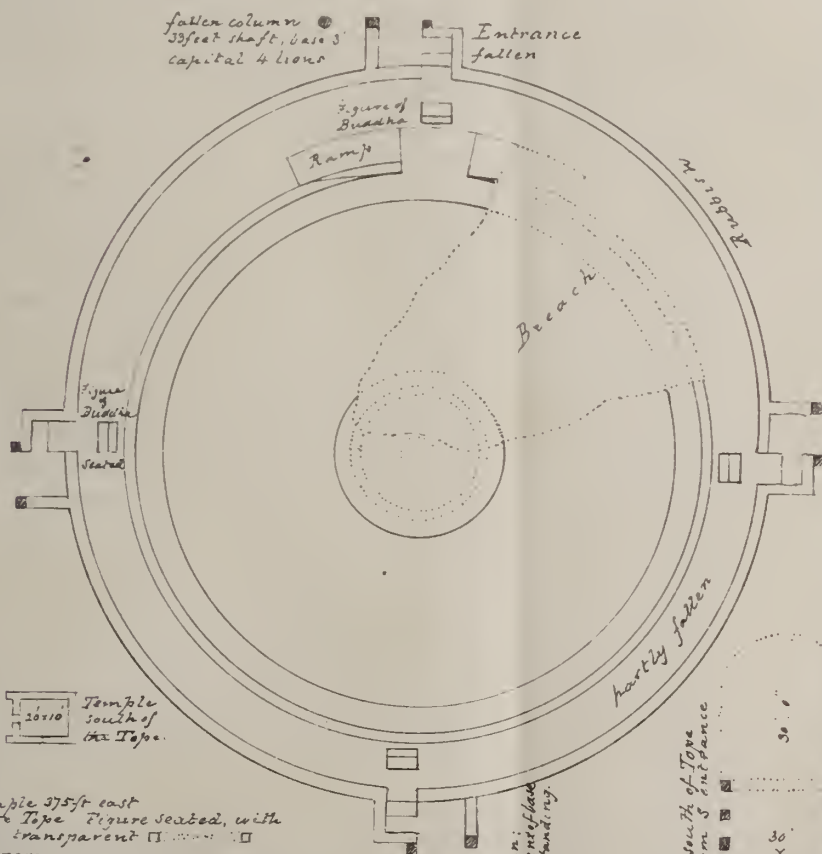
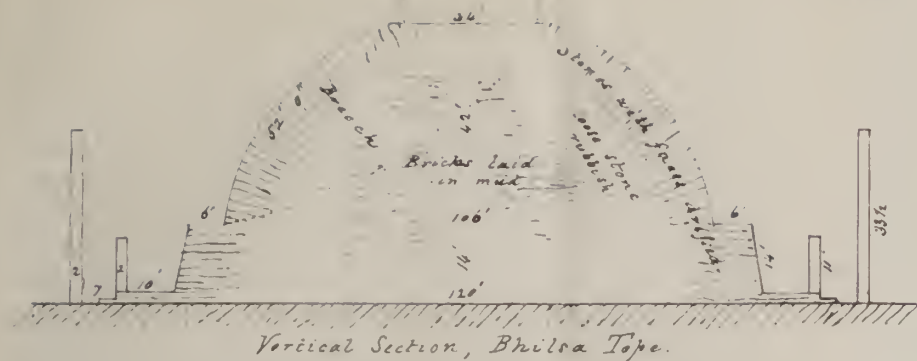
Instead however of driving small galleries at nearly the level of the ground into the interior, the explorers began digging pits as it were into the buildings, from the top or at about half way down the side, and as the stones used in the construction of the hemispheres were not cemented with lime, a third of one monument and a fifth portion of the other have been destroyed. Falling rubbish has upset or buried stone colonnades and the searches for coins or inner chambers do not appear ever to have reached the bottom of either Tope.

The two Topes in question are commonly known as the "*Sass-bhow ka litha*" or as the "wife's and good mother's dung stacks," from their supposed resemblance to heaps of dried cowdung cakes. The word "Tope" is wholly unknown in this part of India, although it is the representative of a Sanscrit original.

The Buddhist monuments at Satcheh are built on three platforms or stages, and stretch east and west across a low range of hills. The highest portion of the highest platform, the edge indeed of a precipice, is occupied by a temple containing an image, and flanked on either side by rows of chambers. This uppermost stage seems moreover, for the most part to have been covered with buildings or cells used by the members of the religious establishment at the place. The centre nearly of the middle platform is occupied by the larger Tope at a distance of about 140 yards from the temple or shrine already mentioned. The smaller Tope is at a somewhat greater distance from the larger Tope, and occupies the third or lower stage which however has never been completed or properly cleared.

On the upper and middle stages there are several small temples or shrines, some of which still contain images of Buddha mostly of the kind which represent him as seated on the lotus-adorned throne. Some figures have a light drapery which does not conceal the shape, and in some the halo which usually invests the head is carved to resemble the expanded hoods of snakes. The shrines themselves are all flat-roofed, and not of the ordinary "*Chaitya*" or "*Degopa*" type with which the labours of Mr. Hodgson have rendered us familiar. On the central stage also are remains of what seem to have been small Topes, and indeed in one instance a regularly built circular wall is plainly discernible.

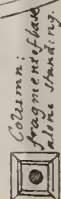
The larger Tope has a circular base 120 feet in diameter, according to a rough measurement. The basement is 14 feet high and it slopes



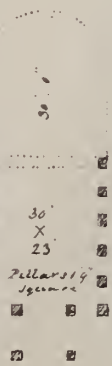
Temple 375ft east of the Tope. Figure seated, with close transparent drapery.



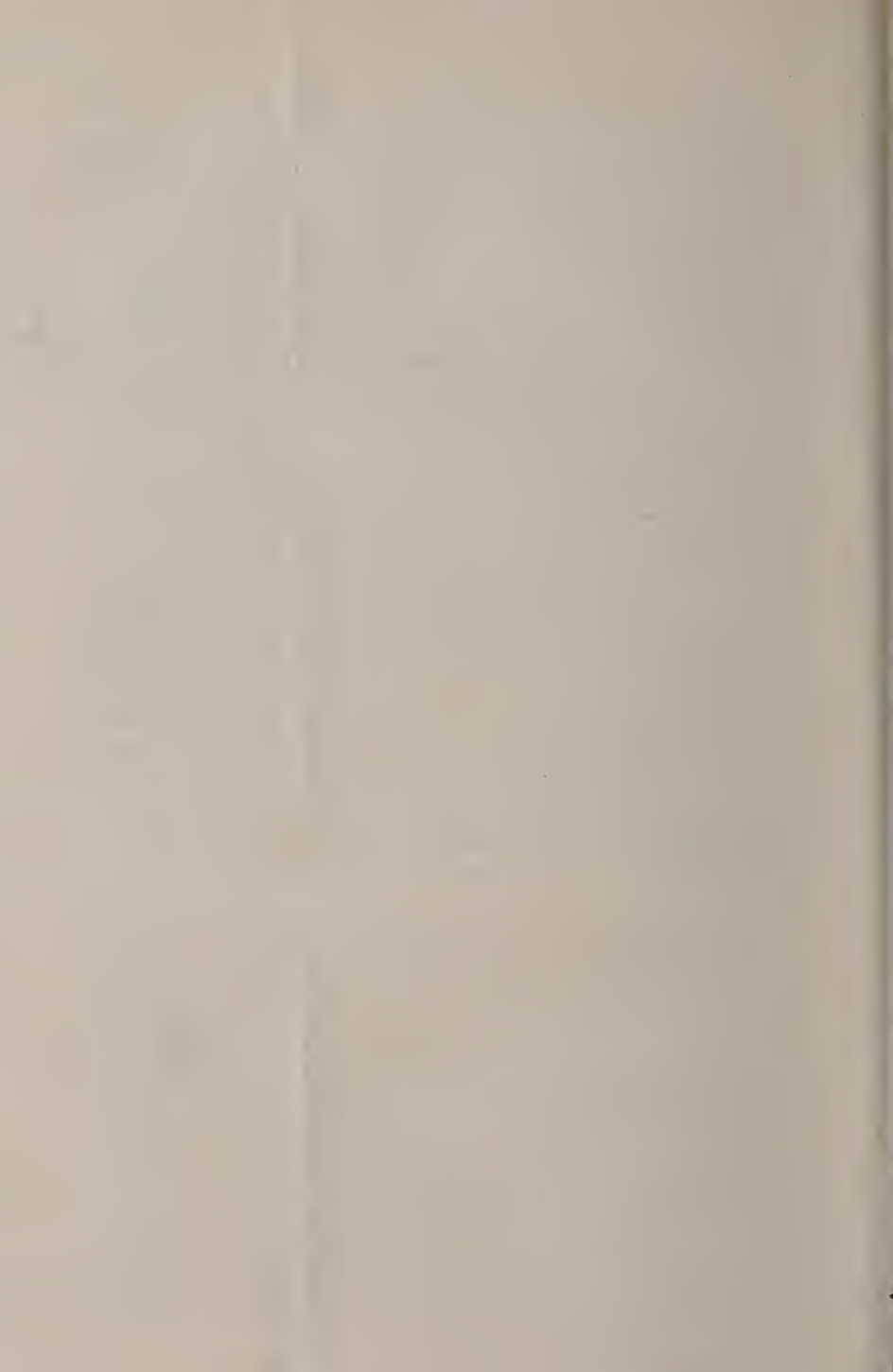
Capt J.D. Cunningham del.



Temple south of Tope 82 feet from S entrance



J.M.L.



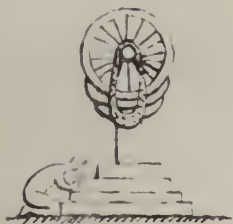
one foot in that height. A berm or pathway of six feet is then left all round and form this basement springs the "Tope" itself with a diameter of 106 feet or thereabouts. Its height is 28 feet, or including the basement 42 feet; the hemisphere is not perfect if indeed any such geometrical figure was ever intended, and the top forms a circular flat of 34 feet in diameter. The Tope is encircled by a stone colonnade, or rather railing or balustrade 10 feet high, at a distance also of 10 feet from the basement while at opposite sides, corresponding with the cardinal points, are four entrances into the passage formed round the monument by the railing in question. Within the passage, and opposite the entrances are images of Buddha with their backs to the basement. The image at the southern entrance is erect, i. e. it has been cut in an erect position; and opposite the southern entrance also are ramps or slopes leading up to the berm or pathway. The Tope was originally surmounted by a kind of cupola, or at least by a circular railing of stone supporting one large central ornament or "Kullus," but the exact description of the upper work cannot now be ascertained. It further seems certain from fallen remains that the pathway surmounting the basement had a balustrade of stone on its outer edge about two feet high. The Tope was apparently built solid, a thick column or shaft of brickwork being first raised, to serve probably as a foundation for the upper cupola, and then encompassed with stone work, the outer blocks having their faces dressed, although they were not jointed with lime. The whole building was then cased in mortar to a thickness of about four inches.

The smaller Tope corresponds in plan with the larger, but its lower base is only about 48 feet in diameter and its upper about 37 feet. The ramp also leading to the pathway above the basement is opposite the eastern entrance instead of the southern, and the lofty gateways in the encompassing stone railing which distinguish the larger Tope are wanting in the smaller. The accompanying plan and section of the larger Tope will however sufficiently illustrate the characteristics of both buildings.

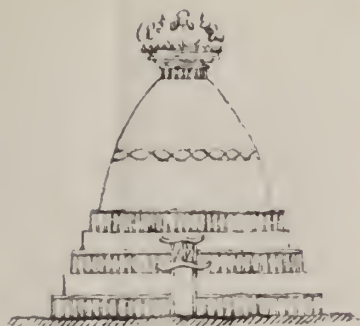
Adjoining the northern and southern entrances stood two columns of stone, and perhaps more. One of these is about $2\frac{1}{2}$ feet in diameter at the base, and the other about 3 feet, with a shaft of a single block 33 feet in length. At the southern entrance there would indeed appear to

have been a second column close to the first, as the segmental fragment of one still protrudes two feet out of the ground. Adjoining the eastern entrance there is likewise a small pillar now standing with a base one foot in diameter and a shaft 13 feet long, and it seems probable that many similarly detached pillars formerly adorned the building. The capital of the southern column is formed of four lions, but a fallen capital on the northern side is of a kind which seems to have once been so much in use as to have formed the characteristic of a style. It consists of a bell-shaped stone, fluted, and surmounted by an "abacus" so thick as to be almost cubical. The style of the capital will however be best understood from the accompanying drawing. On neither of the capitals do there appear any marks as if they had sustained images of men or representations of the sun. They may nevertheless have done so, as the cup-shaped top formed by the lions' heads in one instance, and the broad basis furnished by the square "abacus" in the other, would leave a heavy stone figure in little need of support from tenons. On a pillar still existing in the same tract of country and on the representations of others, men or animals or a circle, i. e. the sun, surmount the capitals.

In an architectural and perhaps in an antiquarian point of view the most remarkable portions of the monuments are the stone railings or inclosures, and the pillared gateways with triple architraves. The railing consists of stone uprights or columns, 2 feet by 1 foot 9 inches in base and 8 feet 8 inches in height, and only an inch or so more than two feet apart. A plain architrave, as wide or thick as the uprights, two feet four inches deep, and slightly rounded at top surmounts the columns. Between the columns again are three cross pieces likewise of stone, two feet one inch or so in length, besides the supporting ends or tenons, two feet four inches in depth, and 9 inches thick, but their section is elliptical or doubly segmental, that is the perpendicular axis is 2 feet 4 inches and the vertical 9 inches. Between each bar or cross-piece there is a space of four inches only, so that the inclosure is almost in effect a dead wall. The railing however must have been felt to be characteristic or symbolical, and it occurs frequently as an ornament among the sculptured reliefs. The abacus also of the capital of the column at the northern entrance has been carved so as to represent this species of inclosure.



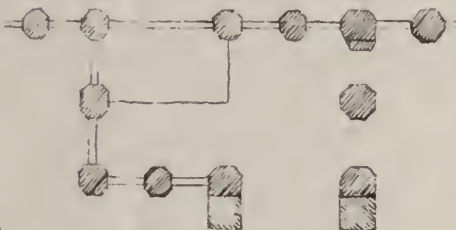
From the sculpture on the
sides of the pillars enclosing
the smaller tope.



Elevation of a tope, as
seen from one of the
entrance pillars.

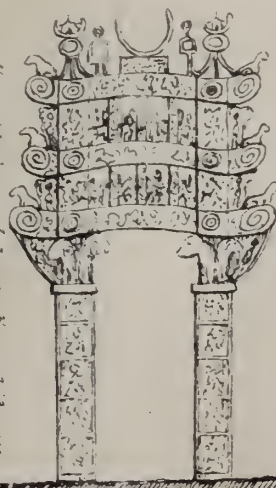


Elevation of the enclosure the roof-
piece double segments of a circle



Plan of an entrance.

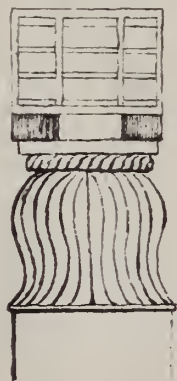
The right spaces between the architraves
occupied by carvings of animals and horses
below, and by carvings of figures above.



pyramid with flames
rising from entrances.
(from reliefs of large tope)

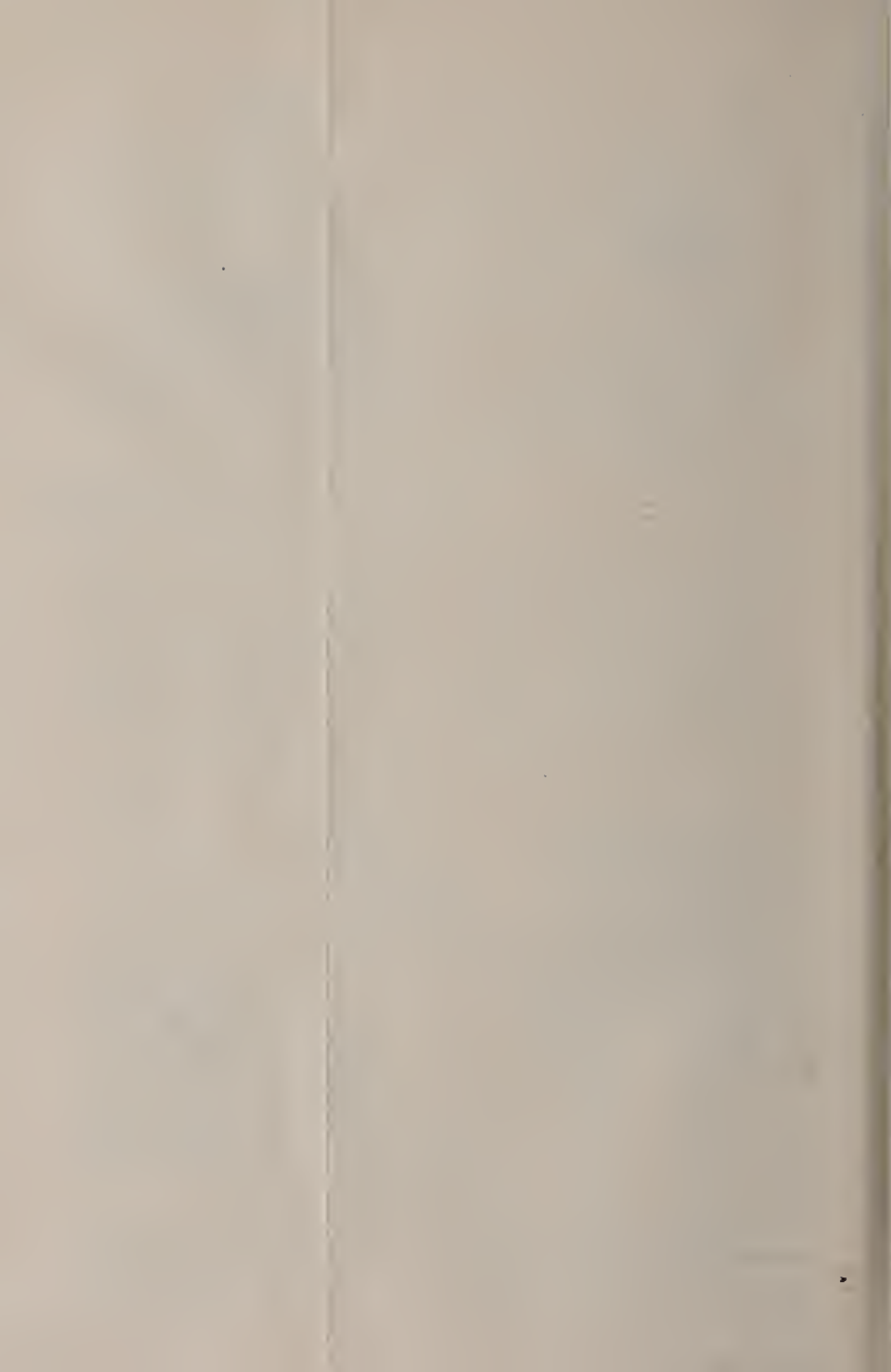


Standard
or ensign



Capital of column
separate from + V. of tope.

Elevation of an entrance to the tope.
the capitals of the columns may be
elephants or lions, or dwarfs.



The entrance gateways are formed of two pillars without bases, seven feet apart, two feet three inches square in section, and including the capitals, eighteen feet four inches in height. On the capitals rest an architrave nearly two feet square in section, and which projects about four feet three inches beyond the pillars on each side. The architrave rises slightly in the centre, and the ends are also somewhat turned up, and carved so as to represent volutes or scrolls. Over the capitals, the architraves somewhat thicken, so as to support continuations of the columns. A second architrave thus lies parallel to the first at a distance of about three feet. It is not quite so long or projecting as the lowest, and a third architrave is still shorter than the second. On the ends of the architraves are seated lions, and between the architraves are figures standing, or seated on elephants, or camels, or horses. The pillars, so to speak, terminate in tripods supporting globes, which again sustain a kind of crescent encircling an ornament. Upon the centre of the topmost architrave rests a large crescent, if indeed the circle was not originally complete. The crescent is five feet high, which gives a total height to the gateway of 33 feet 6 inches. The capitals of the columns are formed in one instance of lions, in another of human dwarfs, and in two instances, I think, of elephants. From the astragals, or from the necks of the capitals, stretch female figures to the ends of the architraves. The columns, except where they abut against the stone inclosure, are elaborately ornamented with flowers, or human or animal figures in relief, or with representations of trees and temples, of religious ceremonies, and occasionally of the practice of mechanic arts. A detached gateway, which probably formed an entrance into the cleared area or platform, is similar in style and ornament, but not so large in size.

These gateways are not displeasing to the taste, although the superstructure seems too heavy for the baseless columns. The bas-reliefs, which give the human figure a height of six or seven inches, show some fancy in design and some skill in execution. They surpass the ordinary productions of the present day, without being equal in accuracy of proportion or excellence of workmanship to what may be seen in some brahminical temples, or to the works at Ellora or Ajunta as given to us in drawings.—Their value however consists in what they make known about a former people, and while it would be idle to attempt to describe

the subjects treated of in the many compartments, I may make a few observations on matters of some interest which they help to illustrate.

There are several representations of "Topes," mostly with one terrace, such as that actually existing—but one at least shows two terraces. Each "Tope" is surmounted by a circle of stone pillars, on which again rests a succession of architraves projecting one beyond the other so as to give a greater breadth at top than at bottom. From this highest platform again rises usually one "Chutree" or umbrella, but sometimes three are seen to spring from it. The stone inclosures round the basement, correspond exactly with that still existing—and the terraces with balustrades show that they could be reached, and indeed that they were formed for purposes of circumambulation. The crowning stone inclosure could also probably be reached by some temporary means of ascent—for there is no sign of any winding pathway round the building, either in the existing "Topes" or in the representations given in the reliefs. Nevertheless I think the Tope of Manikyala in the Punjab has such a spiral ascent.

With regard to religious ceremonies or opinions, the reliefs give representations of the adoration or consecration of Topes—of the adoration of trees and of the devotion paid to the sun.—Men and animals, wild beasts and tame, come separately, or crowded together to offer up prayers at a "Tope"—or to bow to a tree growing out of a square or circular vessel or urn, or to adore the sun, resting the edge of its disc on the capital of a column. There are likewise images of Buddhas seated, male, and in one or more instances female, to whom perhaps some are offering worship. There is moreover a representation of a boat with a raised prow terminating in a lion's head, and a raised stern ending in a fish's tail, which contains an oblong seat or altar with a canopy. Two men stand by the side of the altar, one with a "Chowree" and the other with a "Chatta" or umbrella. If the altar is simply a seat, it is not at least represented as being occupied. In every direction the hooded snake—or at least the hood alone is to be seen veiling or sheltering or protecting the worshippers of the tree and the sun and the temple. Winged human figures are also to be seen as if hovering round a temple to guard it—and monkey-men, and monsters with human bodies and the heads of beasts, are occasionally seen side by side with ordinary mortals. Lastly, a square based pyramidal "Tope"

with a regular inclosure of pillars has four doorways with pointed arches, out of which are issuing flames. Nowhere did I notice a figure invested with the thread of the brahminical faith.

With regard to race these sculptures show that the dominant people was in dress and in many usages such as we may consider the old Hindoos, whether Brahminists or Buddhists, to have been. Another class however is also shown wearing a short tunic and a kind of cap, and who for the most seem to be engaged in menial offices or mechanic arts.

Among the animals represented, the elephant, the camel, the horse, the ox and the lion, are the most conspicuous. Birds and fishes and snakes are likewise shown. Among the birds, the peacock is prominent. Of the monsters represented are dragons, winged lions with beaks, horned and cloven-footed elephants; elephants terminating in fishes, centaurs mounted, and human bodies sustaining the heads of dogs or asses. The human portions of the centaurs seem female. Most of these fanciful or mythological animals are to be seen on the inclosure of the smaller "Tope," every pillar having three basses or circular spaces ornamented with reliefs of men or beasts or trees, &c.—It is to be observed that a Tiger nowhere appears, and that lions with bushy manes are frequently depicted. Sometimes they may be seen carrying away horned cattle smaller than themselves. Elephants, camels and horses are all used for riding, while chariots may be seen drawn by horses and containing an armed man with ensigns borne before him. Bullocks are likewise represented drawing cars.

The condition of life, or the degree of civilization of the people, may be further judged of by the representation of buildings with arched cloisters or colonnades, and with terraces and balustrades, or with balconies containing several people seated. The recurrence of water in waves with boats and with fish gambolling about would almost point to a maritime people, or to artists to whom the sea was familiar.

The inscriptions* which are now forwarded are all cut here and there upon one part or other of the stone inclosure, excepting one, which is fragmental only, and which is visible upon the remains of a column at the southern entrance. None may be contemporary so far as we have any fair reasons for concluding, except *probably* two and *possibly* a

* Most of these have been published in the sixth volume of the Journal; such as are new will be given hereafter.—Eds.

third. The two in question are cut on the representations of "Topes" sculptured on the southern entrance which has fallen, but which when standing had the representations in question out of the reach of pilgrims and visitors. The third inscription occupies a band between two compartments on one of the pillars of the eastern gateway, and could not readily be reached. The two longest inscriptions are cut on the stone parallels or cross-bars of the inclosure, and could be removed for transmission to Calcutta without injury to the monument, except such as would arise from their absence.

The temple close to the eastern entrance to which Captain Fell alludes [*Journal As. Soc. of Bengal*. III, 493] is now wholly in ruins, and I did not notice the Sanscrit inscription giving the date of 20 Sun-but. I regret that Captain Fell's paper was not before me at the time, otherwise the search I should certainly have made might have recovered so valuable a record. I may here observe that Captain Fell's measurements of the circumference and height of the monument should be more accurate than mine, as it is now somewhat ruinous. I am sorry however that our measurements of some details do not agree better than they appear to do.

The Topes at Peepleea-Bijolce do not appear to have been before brought to notice. Three of the most conspicuous stand on the sloping top or back of a low hill, and seven or eight or more, nearly in a line, occupy a lower stage on the same hill. Between two of the upper Topes there is a square platform of earth and rubbish 18 or 20 feet high,—supported by walls of masonry, and ascended by means of a ruinous flight of steps, on which stand the remains of a small temple containing a statue of Boodha surrounded by numerous emblematical figures, and among them, two of men wearing the thread of the twice-born Hindoo classes. The largest of the Topes in question does not appear to exceed 60 feet in diameter. All have a plinth or basement, from which springs the Hemisphere, and all have ramps by which the berm or pathway formed by the plinth may be reached. They appear to have stood within square courts, but there are no remains of circular inclosures of stone with the ornamented entrances which make the Satcheh Tope so remarkable. All of these Topes are more or less ruinous, and there are several heaps of loose stones which once probably formed small Topes. No inscriptions were any where observed.

It seems now to be certain that "Topes" are temples rather than tombs, and every thing I have observed of their structure, or which can be gathered from the representations given of them, corroborates this view of their use or purpose. They may nevertheless have occasionally been raised over the dead,—or some, like the gigantic one still existing at Unrodhpooa in Ceylon, may have contained such small and straggling chambers for the reception of funeral urns as are traceable in the pyramids of Egypt for the deposit of mummies. Their primary connection was however with the worship of the Divinity as then practised—and a consideration of their structure, and a comparison of the usages of the Jains, all show that a "Tope" was intended to represent Mount Meru,—the central mount of the world, the native seat, or point of divergence of the Caucasian races with its four shadow-giving trees,* and four divergent rivers† which watered the earth. The Jain temples still contain models of towers, square or round, standing in inclosures, and diminishing by successive stories with balconies. These towers the "Juttees" or Jain priests declare to be symbolical of Meru, round which pilgrims should solemnly walk with their right hands to the mount. Circumambulation is still a ceremony of the Hindoos, more particularly during the Deewalee, or festival of light, at the temple on the fabled hill of Goverdhun near Muthra :—further, the holy hill of Gungree, the source, as is believed, of the Indus, the Sutlej, the Gogra [or Ganges] and the Burrampooter, is still, as I often heard when in Tibet, encircled by Lamaic pilgrims; the construction of the Topes admits of or provides for worshippers moving round and round them :—the Jains now perambulate within the square areas of their temples and draw Parasnath on certain occasions on his elephant or car through the inclosing cloisters, that is round the square court, and lastly the Buddhists of Tibet similarly pass round and round the oblong structures of stone which are found near every village.

The worship of the tree which occurs so frequently among these sculptures has left its traces in the regard still paid by Jains and Hindoos to the Burr and Peepul trees, or especially to the Burr, the Peepul and the Awnla when growing together. To this devotion may also be referred the circumstance that no Hindoo will ever cut down or

* Jamun, Kuddamb, Burr, Peepul.

† Sceta, Bhudra, Chuksoo, Alikunda.

injure the tree of his birth or life, that is the tree dedicated to the day on which he was born, and which trees are made 27 in number, to correspond with the mansions of the Moon.

The worship of the Peepul and the superstitious regard paid to the tree of birth, lead the mind back to the Biblical injunctions about the tree in the midst of the garden, and the vessel containing the altar as represented in the sculptures, is almost a counterpart of the ark or sacred boat of Egyptian processions, and which has served to illustrate the ark of the Jewish covenant, except that waving punkahs and chowrees, the marks of dignity and respect, take the place of the overshadowing wings of angels or cherubim.

The actual worship of the serpent is not apparent among these reliefs, but their hoods every where protect worshippers, and snakes themselves sometimes seem the companions of devotees. Nevertheless on the smaller Tope there is a representation of a bird destroying a serpent. The subject however of the serpent-guarded race will be noticed in describing the next series of remains at Oodehghir.

The marked devotion paid to the sun deserves notice mainly in connection with a snake-protected people, and with the worship of the tree and of the sacred mount. An unfinished inscription in a ruinous temple at Oodchpoor is solely in praise of the sun, as will be again noticed, and it may be well to bear in mind the existence of the "Saurya" sect among Hindoos, of the "Hom" offerings, and of the import of the brahminical "Gayatri."

In considering the structure of these Topes with their one or more terraces, and with entrances which images guard or sanctify, and in reflecting on the fact of their disuse for many ages among the Jain representatives of the Buddhists, one is almost led to the conclusion that as brahminism prevailed, the *terraced mount* gradually became changed into the "Gopura" and "Vimana"—the storied entrance and *solid* pyramidal temple of the superstitions of the south of India. A Pagoda still comprizes entrances, and courts, and shrines, as well as a principal place of worship, and such was very much the plan of the ancient Buddhist edifices under consideration, while the succession of doors which lead to nothing, or abut against a solid wall, seems but an improved copy of what a Tope must have presented with a succession of stories, and with entrances admitting merely to narrow passages.

One can indeed almost trace the elongation of the terraced Tope or "Degopa" into the storied temples of the Buddhist Chinese, and into the great Minar or tower at Delhi, which is surrounded with Buddhist remains. The buildings of the Nepalese show the transition or intermediate state in the one instance, and the present Jain models of Meru or of a Tope, well represent the Qootub Minar with its succession of balconies. The traceable change of the flat Basilica of declining Rome into the lofty Cathedrals of the middle ages seems to illustrate this speculation.

The impression left on the mind after an examination of these sculptures is, that while they are eminently Indian in their characteristics, there is nevertheless something Persian or Babylonian, and also something Egyptian about them. The Persian seems the stronger of two complementary elements, and the impression at the same time is, that the people of Mesopotamia influenced those of India mainly by sea, and not by land routes and communications, or through commerce and emigration rather than by conquest, but that the snake-protected Buddhists did so by military expeditions also is more than probable.

Oodeghir.—To the west of the Betwah river, and a mile and a half or two miles from Bhilsa, there is a low range of hills named Oodeghir, in the soft sandstone of which many small caves or niches have been hollowed. The largest is dedicated to Shiv, and is 17 or 18 feet square, with 4 pillars, all cut out of the solid rock. This temple contains a Sanscrit inscription of little interest except that it gives a date, viz: 1093 Sumbut. There are also many figures sculptured outside the entrances, but most of these represent single divinities or heroes, and the interest of the series centres in two groups, one showing Vishnu as the Varaha avatar, or with a human body and the head of a boar, and the other showing Vishnu slumbering on the vertical folds of the serpent,

The Boar manifestation is 8 or 9 feet high, and is almost detached from the rock out of which it is carved. The god supports with his tusk a small female figure, which seems to cling to this natural weapon of the divinity. In front of Vishnu, there is a larger sized female figure, kneeling, and with uplifted hands imploring him as if to spare, perhaps the virgin in his power. This figure has the expanded hood of a snake over her head. Behind her there is another figure, also kneeling, but much mutilated. On the solid wall of live rock there are

sculptured above, before, and behind Vishnu, numerous small figures in successive rows and as if forming processions. Nearly all of these have the short tunic and cap noticed among a few of the figures of the Tope gateways. Some of the people represented are playing on musical instruments, and hence the country people call the monuments by the name of "*Mama Banjeeka Burát*," or "the uncle and nieces marriage procession."

The figure of Vishnu reclining on the serpent is about six feet long and is likewise in bold relief. The head of the reptile with its many-eyed hood, curves over the head of the God as if to protect or shadow it. The several Hindoo Divinities are represented by their symbols, of a bird, &c. as spectators of Vishnu's greatness.

The inscription sent is apparently incomplete; it is to be seen upon the rock near the Boar-god.

These sculptures seem typical of the triumph of Vishnu over the Serpent, of Brahminism over Buddhism, and it is to be regretted the date cannot be ascertained, for the 1,093 Vicramaditya already quoted may have been inscribed by some pilgrim.

Of the Jain hill three miles N. W. of Oodehghir, and of the unfinished figure of a horse south-east from the Satcheh Tope, which are mentioned by Dr. Yeld or Captain Fell, [Journal As. Soc. III. 489] I did not learn, but as I knew not that such had been noticed, I could only inquire generally for monuments and remains.

Ghearispoor or Gheiaspoor.—Ghearispoor, or Gheiaspoor, is on the road between Bhilsa and Saugor, two marches east of the former place. The Hindoos connect the name with the importance they attach to the 11th day of their half months, and the Mahometans regard one Ghcias as its founder. It is certainly a place of some antiquity, and among its remains the Buddhist temple deserves notice. The site of the temple is nearly at the top of a sandstone hill, and it is built on a platform gained from the hill by making the step side a complete precipice. A small square "adytum" with pillars before it supporting a dome, is inclosed in a rectangular building about 50 feet long by 30 feet wide, which has one entrance with a portico in front of, or outside, the four pillared domc. The external walls are not finished, for the live rock prevents the completion of half a side and a portion of the back or end. The "adytum" is surmounted by a pyramid or spire, resting partly on

the external walls, and as in front of it there is the dome, the temple resembles the ordinary Indian type, except that it is more rectangular and less "crucial" in plan, and that it has one entrance only instead of the three common to many other temples of the same dimensions.

There are several images of Buddha in this temple, and among the sculptures may be noticed a figure resting on a cornucopia, and a "Merman," or a human head and shoulders, &c. with a fishy extremity. The merman's head is shaded by a serpent's hood. Birds eating clustering fruits are also carved with some spirit.

There are no inscriptions on this building except such as pilgrims or visitors may have cut; one of these is dated 1551 Sumbut (1494 A. D.) one period of the re-assertion of Hindoo independence, but the temple serves to show the Buddhist love for hilly spots; and this ornate edifice is situated much as the comparatively rude "Tope" in the Khyber Pass has been placed, or like that of Belur and others near Rawul Pindee.

Oodehpoor.—The decayed town of Oodehpoor is situated to the eastward of the Betwah river, and to the eastward likewise of the road leading from Bhilsa to Seronj. It stands at the foot of an isolated standstone hill, and is said to take its name from Oodehajeet, a lineal descendant of Vicramaditya and of Bhoj, who acquired a great name in Malwa about the middle of the 11th century of our era, and whose rights are declared to be still inherent in a Powar Thakoor, the Zemindar of the Pergunnah.

The temple of Mahadeo at Oodehpoor, is still a work of great beauty, although it has been much injured by the Mahometans. Its ground, plan forms a Greek, or nearly equal-armed cross, with the outline everywhere broken by regular projections, and with the corners filled in, much as we are told Sir Christopher Wren wished to do when he built Saint Paul's. It is about 70 feet long by about 60 wide; the walls are thick,—three arms of the cross contain entrances with external portieos, while the fourth, opposite the main entrance, forms the "adytum" or recess in which is placed the Lingam or mark of Siva. The interior forms an irregular or broken rectangle, which again includes right pillars forming an unequal-sided Octagon. Over the Adytum or Lingam rises the usual storied or clustered pyramid, while a dome with side vaults rests upon the other three arms of the cross and upon the eight

pillars. The temple is built of red sandstone without lime, or at least without any readily perceivable in the joints, for the blocks are very nicely fitted. Every stone is an ornament in itself, a human or animal figure, or a flower, or a portion of a fillet or ovolo,—but the individual beauty has at the same time been rendered subordinate to the general effect.

The Lingam with its shapely pedestal is about eight feet high, but the plain cylinder has been capped with a brazen head, to make the presence of the god more clear to the apprehensions of the rude and the superstitious. Under the dome and facing the Lingam, is placed the cumbrous recumbent Bull dedicated to the divinity.

On a stone of the passage of the main entrance there is a long Sanskrit inscription, but the door opens back upon it, and as the passage is not well lighted otherwise, the partial closing of the entrance makes it so dark as to render the writing difficult to decipher. Many of the letters have also been imperfectly cut or are now defaced, and the transcript which is sent may not accurately represent the original. It is such however as three or four men tolerably well versed in Sanscrit were able to make of it, and it cannot be far wrong in any essential point.*

As it has been read to me, the inscription states that Bibodh, Gokul Deo, and Gheata (or Soojan, who built many temples to Shio) were succeeded in the dominion of Malwa by Oodehajeet, who died in 1116 Sumbut (1059). After Oodehajeet the power of the Yuvvuns or Mahometans prevailed for 446 years, at the end of which time Chanddeo became powerful and was termed the Lord of Magadha, and whose son, Lohugraec, collected stones for a temple in 1562 Sumbut, (1505 A. D.) The inscription concludes with the remark that what had been understood had been written, and it is hence probable that it is not a contemporary record, but the work of some pilgrim, and that the temple may in reality have been built by Oodehajeet about the middle of the 11th century of our era. The rise of Chanddeo is synchronous with the dominion of Singram Singh of Chittor, the Rana Sanka of Baber, and is another corroboration of the declension of the Mahometan power which took place under the Khizzers and Lodis of Delhi.

The Toghluks in their career of conquest, visited and defaced this elaborate temple of idols, and built within its precincts a simple mosque to the God of Mahomet. The mosque is still standing, and

* This inscription has been given with translation, in Vol. IX. p. 545.—Eds.

its gates or entrances, now represented by two solitary jambs with broad lintels, are within a dozen yards of the back of the temple itself. There are Arabic inscriptions over these gates, to the effect that the mosque was built in the year of the Hijree 739 (1338-39 A. D.) and in the reign of Abool Moojahid Mahomed Ibn Toghluk Shah. Another mosque, one of some pretensions, was afterwards erected in the vicinity of the temple. It was finished in 1041 Hijree (1631-32), as the inscription says, "at Oodehpoor on the borders of Gondwana."

The temple at Oodehpoor is perhaps as elegant a specimen of old Hindoo architecture as is now to be found to the north of the Nerbudda, always excepting the Qootub Minar at Delhi. It yields indeed in size to the temple built at Bindrabun by Man Singh of Jeypoor, which was defaced by Aurungzeb, but it surpasses it in the proportions of its design and in the elaborateness of its details. It is a monument moreover of the varying fortunes of brahminism. It was most likely erected when the "twice-born" had fairly triumphed over the Buddhists. Within three hundred years it was despoiled by the Mahometans. In two hundred years more the victories of Rana Sanka allowed votaries once again to flock to it, but the rise of the Moghuls soon consigned it a second time to the neglect of the rich. The Moghuls fell, and a dynasty of brahmins from the south mastered the country, and showed at once their gratitude and the grossness of their apprehensions, by capping the simple black stone of Muhadeo with an idolatrous brazen head. This last bequest to the temple is dated in 1841 sumbut (1784 A. D.), and in two generations from that time the new masters from the west, while admiring the beauties of the fabric can trace the corruption which beset brahminism in the hour of its success. Fetichism had been sublimed into a symbolic yet philosophic Deism, but in the eleventh century priestcraft fully appreciated the advantage of mystery, the blackstone is no longer conspicuous in the open air or in the centre of a lofty edifice, it is concealed in an "adytum," a "holy of holies," and the trembling devotee reaches it through a gloomy passage, and can at last only see it by the partial and flickering light of an oil-fed taper.

Oodehpoor has its fane attributed to Jains or Buddhists, as well as its temples, certainly Brahmin and Moslem. The Becja [or Vijaya] mundur is two-storied and about 40 feet long by 20 or 22 feet wide,

exclusive of an entrance porch. It is of somewhat rude or plain workmanship. Its ground plan shows three chambers with a cloister or veranda before them. The upper story has been converted into a dwelling house, the lower is untenanted, but I could not, amidst the rubbish which encumbers it, see any image. On either side of the entrance, tablets have been inserted in the wall for inscriptions, but one inscription only has been begun and two-thirds of what was designed is still unwritten. The language is Sanscrit, but the letters, which are beautifully cut, are Pracrit or Mugadha, or such as are still read by the Jain priests. The subject is the sun and the glories of that great luminary, but no date or name helps to fix the era of its erection or the faith of its builders, and it is perhaps tradition, rather than certain knowledge or probable criticism, which makes the several "Beeja mundurs" of this part of India to be Jain temples. In structure however this one at Oodehpoor closely resembles the low-roofed Buddhist temples or shrines still visible around the Tope at Satcheh.

Ehrin.—Ehrin, in the Saugor territory, is now a village on the left bank of the Beena, near its junction with the Betwah, about 25 miles N. E. from Serong—but it appears once to have been a town of some local repute—small copper coins can still be found after each successive annual denudation of the mounds which mark its site, and several adjoining monuments of stone, the remains perhaps of an extensive integral series, make the place well known for many miles around. Some of the coins accompany this letter, but nothing perhaps can be made of them.*

The most remarkable of the monumental remains is Vishnu manifest as the Boar. The animal stands about 10 feet high with his snout in the air, and it is in length perhaps 12 feet. The body is carved all over with successive rows of small figures having the short tunic and high cap or head dress remarked at Oodehghir and Satcheh. A band, ornamented with human figures seated, encircles the neck of the animal. The tongue projects and supports a human figure erect on its tip. A young female, here, as at Oodehghir, hangs by the arm by the right tusk, while the breast is occupied with an inscription, of which a copy has been made as accurately as its mutilated state and the short-

* Small, square and much worn copper coins, with the *bodhi* tree, the *swastica*, and other Buddhist emblems. — EDS.

ness of time would allow.* The Boar itself is ill-shaped, but the human figures show more skill in design.

To one side of this "Owtar" stands a four-armed Divinity, 12 or 14 feet high. His habiliments are Indian, that is, his loins are girt. He has a high cap or head-dress, while round his neck and reaching to his feet there is a thick ornamental cord resembling a modern "Boa," with its ends joined. The vestibule of a small cupola which once probably covered this statue is still standing. On these entrance columns are seen figures who wear the *Juneeao* or thread of the noble Indian races, in addition to the ornamental cord above described. Other devices consist of twisted snakes, suspended bells—of figures of elephants, fishes, frogs—of women naked, recumbent, and giving suck to children, and of seated Buddhas. There are also many faces of Satyrs, filling bosses or compartments.

Behind a small pillared temple there still stands a figure with the face perhaps of a lion—but with a human body and with human limbs.

The above three figures form one row or series, with however, other undescribed remains between them or beyond them. In front of them there are three figures of couching lions, and in front of these again, are two columns or rather one pillar and a fragment, and a small temple half buried in the soil. The column has a broad base; for about 15 feet the shaft is square, and for about 10 feet more it is round. The bell capital, described at Satebeh, occupies perhaps two feet, a second capital, so to speak, adds three feet more to the height, and forms a pedestal for a small double fronted four armed statue. On this column there is likewise an inscription which has been copied as well as time and decay would allow.

Among the many figures carved on fallen pillars, the use of the *Juneeao* may be observed, and the whole of the remains are attributed to one Raja Behrat.

At Putaree, in the same quarter of the country, I heard of a stone representation of an animal of some kind, or of a stone which was in someway remarkable, but I had not an opportunity of visiting it.

The monuments at Ehrin are perhaps anteedent to those at Oodeh-

* This inscription has been published with a translation, in Vol. VII. p. 632 of the Journal.—EDS.

ghir, and although they mark the prevalence of *Brahminism*, they look like adaptations from *Buddhism*.

Soondursee.—There are other remains of value or interest in this vicinity, which I may hereafter have an opportunity of visiting, and the three inscriptions noted below may deserve to be recorded. The first is on a small temple to Shiv at Soondursee (or Sindersee) on the Kalee Sindh river, about 25 miles to the south of Sarungpoor. It gives a date 1220 Sumbut, and states that the temple was built by Baba Bulwunt Dukhune. The temples at Soondursee are rude, and the usual marked spire is replaced by a plain pyramid of an attitude not exceeding the side of its base. This rudeness may be provincial only, for although art doubtlessly declined in upper India about that period, a temple to Mahadev at Nimawar on the northern bank of the Nerubudda, about 50 miles below Hosungabad, and which gives a date 1253 Sumbut, shows some taste and skill. It is however much inferior in both points to the temple at Oodehpoor.

Sehore.—At Sehore, 20 miles west of Bhopal, a traditional “Beejamundur” now forms a somewhat rude mosque, giving a date of 732 Hijree (1331-32) which like the Musjid at Oodehpoor, marks the period of Toghluks’s sway.

POSTSCRIPT.—I have referred to the “Maru” of the Jeins as illustrating the belief of the old Buddhists, and as expressing an idea common to all the ancient Indians, and not merely peculiar to the brahmins and borrowed from them by a recent sect. The Jewel-footed Parishnath of the Jeins, may also perhaps throw some light on the well known formula of the modern Buddhists of Tibet, which has been variously interpreted by European scholars,—Mr. Hodgson’s little volume on the literature and religion of the Buddhists, p. 171, &c. may be referred to, and it will be seen that M. Klaproth gives two translations, while M. Csomadekörös, Sir Wm. Macnaghten, and Mr. Hodgson himself give each one. All of these versions turn upon “Padm” as meaning Lotus, and M. Csomadekörös, states that such is the interpretation put upon it by the Lamas themselves. Padm however means foot as well as Lotus, and the Jeins still worship “*Mani Padom*,” or him of the Jewel-foot, while the idea of feet so enriched or adorned is common to the whole Indian world as implying Divinity, although perhaps, like the silver-footed

Thetis of the Greeks, the image may have been poetical only in the first instance. The accompanying transcripts satisfy the Sanserit scholars of this quarter, and they seem accurately to represent the two originals, the "Ranja" and Tibetan copies respectively. It will be observed that the Tibetan makes the Godhead or the Divine essence or emanation to be feminine, if the rendering now given is admitted to be correct.

The last word of the formula may apparently be regarded as a "Beej" (vija) mystic root or germ equally with the first, and the meaning will thus become "The Lord, the Jewel-footed, the preserver." This translation does not affect the characteristic of Mr. Hodgson's "Padma Páni" or present Lotus-handed Regent "Dhyani Bodhisatwa," but it interferes with the functions of the "Oon," gone bye, he of the *Jewel-bearing* hand, *Jewel-footed* seems to be the more ancient notion of the two, and it will be curious should the Nepalese Buddhists appear to have founded a distinction between themselves and other worshippers of representatives, by removing the essence or symbol of Divinity from one limb to another.

On the Tibetan Badger, Taxidia Leucurus, N. S., with Plates. By
B. H. HODGSON, Esq.

Carnivora.

Subplantigrada.

Arcto galida. H. Smith. Genus meles.

Subgenus Taxidia.

Species new. T. Leucurus; Mihi.

Túmphá of the Tibetans.

Habitat. The plains of Tibet.

There is not yet, I believe, any record of the Badger as an inhabitant of the east. The occurrence, however, in the sub-Himalayas of the allied forms of *Helictis*, *Urva* and *Ursitaxus*, has led me for some time past to expect such a discovery in the Himalaya or Tibet, and my anticipations have just been fulfilled by the receipt of a very fine specimen of the Badger from the neighbourhood of Lassa. The spoils obtained by me are those of a female of mature or advanced age, as is proved by the obliteration of the cranial sutures and by the flaccid enlargement of the teats. The animal was killed in the preceding autumn when in full fur, and, as the skin is well prepared without distortion, and as it

is provided with perfect head and limbs, these spoils afford excellent materials for description, exclusive of the soft viscera and their long case, which are wanting.

The Badger of Tibet, called Túmphá by the inhabitants, falls under the North American instead of the European section of the Genus. In other words, it is a *Taxidia* not a *Meles*, of systematists, having only four molar teeth on each side of either jaw, whereas the European type has five molars above and six below, on either side.

The Tibetan Túmphá is a smaller animal than the Badger of Europe or than the Carkajou of America. It is contra-distinguished from both these animals by a considerably longer tail, and also by a locomotive structure not plantigrade, but only subplantigrade, or, in plainer terms, by having a third of the sole of the hind feet thickly covered with hair instead of the whole being nude to the heel. From the Carkajou of America the Túmphá of Tibet differs by the very inferior size of the claws of the posterior extremities,* a point in which the Túmphá agrees with the European Badger, as it also does so remarkably in colours that there is some difficulty, without having both animals before one, in noting their difference in this respect. On the other hand, the disagreement of the Túmphá with the American Badger in point of colour is as striking as is its craniological conformity with that animal and deviation from the Badger of Europe. The last named animal is from $2\frac{1}{2}$ to $2\frac{3}{4}$ feet long from snout to vent, and the tail, inclusive of the hair, is from 6 to 7 inches more. The head to the nape, is $6\frac{1}{2}$ to 7 inches, and the mid fore claw $1\frac{1}{4}$ inches. I have no equally accurate details to refer to for the Carkajou, but it is, I believe, about the size of the European Badger, or somewhat less; and H. Smith says it has a shorter head but stands rather higher on the legs. These references to the Badgers of Europe and America, will I hope, enable the reader better to appreciate the following description of the Badger of Asia, now first noticed as a tenant of this quarter of the globe.

The Túmphá or Tibetan Badger is in total length 37 inches, whereof the tail, with the hair, is 10 inches, and without it, 7. The head is $5\frac{1}{2}$ inches, the palm and nails $3\frac{1}{8}$, the planta or rest of the hind foot,

* H. Smith, describing the Carkajou from life, expressly says that "all the extremities are armed with long powerful claws," or I should have supposed the forefeet only are so armed, as in the Badger and Túmphá. See Note, Lib. XI. 211.



TAXIDEA leucurus (Hodgson)

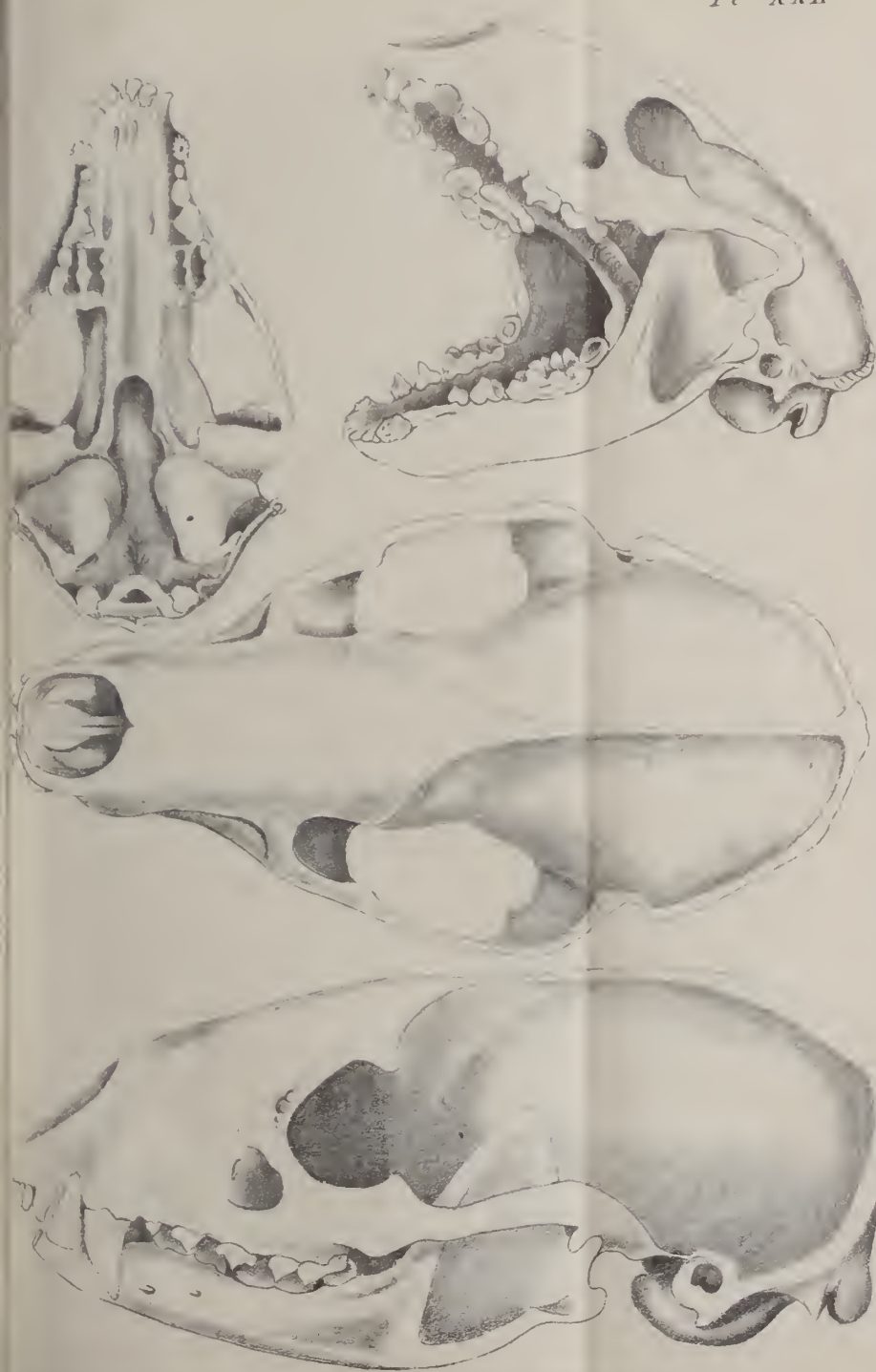
T. Black. Asiatica. Lich. Pr. Ind.

from heel to end of the nails, 4, the longest claw or nail, $1\frac{1}{2}$, the ear $1\frac{1}{2}$, the longest hair of the body, $4\frac{1}{2}$. The aspect is entirely that of a long-tailed Badger, with somewhat smaller head and longer finer fur than usual. The small head is conico-depressed with remote ears and eyes, and sharp elongated face. The muzzle or nude extremity of the nose is clearly defined, rounded, prolonged beyond the teeth, and has an abrupt oblique termination in front. The oval nostrils are opened entirely to the front, their lateral prolongation being merely linear and very much curved. The lips are thin and almost void of monstaches; and there is a still fainter indication of the tufts proper to the cheeks, chin, and eyebrows. The small pig-like eyes are situated midway between the ears and tip of the snout. The ears are oval, well developed and tending to a point. The helix is unfissured and the interior of the ears void of membranous processes, but hid with hair which amply covers these organs inside and out and ends in a full diffused, yet somewhat pointed tuft. The neck and body are rather elongated yet full, and appear even heavy from the copiousness, length and free set of the double pelage. The limbs are low, stout and suited only to slow action on the ground, with the heel very slightly raised, but admirably fitted for digging; pentadaetylous before and behind: the hands larger and stonger than the feet, and furnished with huge fossorial claws more than doubly larger than those of the hind extremities. The palm is entirely nude to the wrist, save only a small central tuft of wool-like hair, and the inferior surface of the digits is likewise quite nude. The palm is not a full soft mass nearly enveloping the digits and hardly distinguishable into halls or pads, as in the Bears and Bear-badgers (*Ursitax*), but is hard, spare of flesh, and distinetly divided into pads which take in only the bases of the four fingers; form a cresented series of irregular shape and diminishing in size from the outside to the inside of the foot. The 5th digit or thumb has no basal pad, it being short and small. The corpal pad is void, large and placed on the exterior side of the palm at its base. The fingers, of medial length and stout, are united as far forward as the postea edge of the terminal pads by a strong membrane not susceptible of much expansion. Their pads form a curvate regular series to the front, like the basal tier abovenoticed, the two central fingers being nearly equal and the two laterals also, interse. The small feeble thumb

is so much withdrawn from the front that the anteal edge of its terminal pad barely touches the posteaal edge of the same pad in the index. The termino-digital balls or pads are very large, suited to keep the great claws from the ground and thus to enable the animal to walk without that inversion of the claws, to which the Ant-eater and Pangolin are reduced. Of the planta or sole of the hind feet one-third, reckoning from the heel to the end of the toes, is thickly covered with woolly hair: the rest is nude. There is no metatarsal pad to answer to the metacarpal one; but otherwise what has been said of the palm will suffice to explain the structure of the planta, inclusive of its digits. The claws of the four feet are typically fossorial, diggers in perfection, being large strong, moderately curved, compressed, with round backs and sharp edges below, except near the points where they are widened and scoop-ed. The claws of the hind feet, as already noted, are very much smaller, and more nearly equal in size in all the 5 digits.

The tail with the hair exceeds $\frac{1}{3}$ of the length of the animal, and is equal to a $\frac{1}{4}$ without the hair. Like the body it is pretty uniformly dressed in long hair extending much beyond the true tail, which is gradually attenuated from a thickish base. The pelage, or fur, is of two sorts, hair and wool, both rather fine, both ample, and both of free set, that is, laxly applied to the skin. The head is dressed in short close hair only. The hair of the limbs is rather looser and longer, and has a very little wool at its base: it is harsh and thick but not elongated as on the body. On the belly the hair is about as long as on the limbs, but scantier much in quantity, and rather woolly. On the body hair is above 4 inches long, and the wool above 2 inches. On the tail there is no wool, and the hair is an inch shorter than it is on the back. The hair is fine, elastic, strong, straight, and somewhat flattened towards the points, but not undulated. The wool is wavy, as usual, and about half the length of the hair. The anal pouch is very noticeably large and has pretty evidently the form of that organ peculiar to the badger,* though its particulars cannot be safely described from any but a fresh subject. The teats are six, remote and ventral, or 2 inguinal and 4 ventral. The papillæ of the tongue are pointed and even corneous, but minute enough to make it feel smooth. The skull is 5 inches long, 2 high and $2\frac{3}{4}$ wide between the zygomæ. It is very

* *English Règne Animal*, II. 271 et 30.



TAXIDEA leniscus (Hodgson)

massive and weighty, and describes a gentle uniform curve from end to end of the culmen : facial portion very small : frontal and cerebral very ample : orbits incomplete postally : a single very large foramen before them : parietes tumid : longitudinal and transverse cristæ moderate : lower jaw very strong, and so completely locked in the cylindric hinge manner, as to be with difficulty separated. Many of these are general characters of the skull in the Badgers proper (*Meles*), and are also found, for the most part, in *Ursitaxus*, *Urva* and *Melictis*. But the teeth are more strictly characteristic. They are in number $\frac{6}{6} \cdot \frac{1}{1} : \frac{1}{1} \cdot \frac{4}{4} = 32$, as in the *Ursitax* ; but, whereas in the Bearbadgers the upper tubercular tooth is disposed transversely and is inferior in size to the carnassier, in the more strictly Melean form of *Taxidia*, the tubercular is ranged in line with the other molars, and is so large as to equal in size not merely the carnassier, but it and the two false molars before it. The first molar of the Tibetan badger is small with a single acutely conic process ; the next is larger but of the same form. These two are false molars. The third is the carnassier. It is of trigonal shape, and as much larger than the greater false molar as it is less than the tubercular. Its exterior side is trechant, obtusely conoid (in profile) and compressed : the other two sides include a flattened oblique grinding surface or internal heel. The fourth and last tooth of the upper jaw is the great tubercular. It is of a squarish shape, but longer than broad, and has its crown marked by 3 longitudinal ridges with two furrows between them. Of these ridges the exterior one only is slightly trenchant and has a saddle-like dip in its centre. The two other ridges are nearly or quite rounded. The posterior margin has an oblique flat slope, purely triturant, upon which the little flat tubercular of the lower jaw grinds with its whole surface. In the lower jaw the two first molars bear much the same character as those above, but are rather larger and have tiny heel-like processes before and behind the central cone. These teeth are also slightly compressed. The third or carnassial tooth is long and narrow, equal in size to all the three others of the jaw, and exhibits a central dip or groove receiving the central ridge of the tubercular of the upper jaw, while its two sides, which are brokenly ridged, fall into the two grooves of the same tooth and its anterior part, consisting of three irregular cones, acts trenchantly against the cutting part of the upper carnassier, or grinds against

its heel. The laniary teeth are void of any peculiarity, so far as can be judged, for they are injured. Of the incisors the of upper jaw the two extreme laterals are longer than the rest and pointed. The others have obliquely flattened crowns upon which the incisors of the lower jaw work in a quasi-tritulant manner. The incisors of the lower jaw are crushed between the two laniaries, there being scarcely room for them in the interval, though the two intermediates are inserted more backward than the rest, seemingly in order to find room. The Badger is alleged to be a dull animal, defective in all the organs of sense. But in the skull now before me of the Badger of Tibet, as compared with that of several allied genera, I perceive no evidence of deficiency, the cavities for the reception of the auditory visual and olfactory apparatus being sufficiently developed, and the brain-pan being unusually capacious; so that one may suspect that if the Badger were to exert his formidable means of offence with greater alacrity he would command more respect from his human enemies. Whatever I have been able to gather as to the habits of the *Túmphá*, makes them accord with those of the English Badger, and is in harmony with the indications of the skull. The *Túmphá* dwells in the more secluded spots of inhabited districts, makes a comfortable, spacious and well arranged subterranean abode, dwells there in peace with his mate, who has an annual brood of 2 to 4 young, molests not his neighbour, defends himself, if compelled to it, with unconquerable resolution,* and feeds on roots, nuts, insects, and reptiles, but chiefly the former two, or vegetables not animals, a point of information confirmed by the prevalent tritulant character of the teeth. It only now remains to describe the colours of the *Túmphá*. The head above and laterally is of a yellowish white, and this colour descends so low on the sides of the head as to take in the edge of the lower jaw to its tip. This pale hue of the head is divided lengthwise by a black brown line that runs from the moustache through the eye to the ear, both inclusive; but neither the dark nor pale colour extends backward over the neck, both being lost, though without abrupt transition, behind the ears. The ears inside and out are basally black, and terminally white. The neck and body above and laterally are of a yellowish pepper and salt hue, paling as you descend the flanks. The tail is void almost wholly of the darker ingredient of the mixture, being

* The captors of mine, were obliged to knock off his eye-teeth, he bit so perseveringly.

scarcely shaded grey near the body ; and elsewhere, pure yellowish white, which colour likewise spreads round the anal and genital organs. With that trivial exception the whole of the inferior surface, from chin to vent both exclusive, as well as the entire limbs, are black, of a more or less sooty tinge. The nude skin, wherever visible, is dark brown, or black as on the belly, where the scanty pelage allows it to be partially seen. The iris is clear brown, and the nails sordid horn colour. The mystaceal and other bristles, blackish : the tongue and palate, pale.

The prevalent grey cast of the colour upon the upper parts of the animal results from the distribution of tints upon the longer or hairy piles and upon the shorter or woolly ones, which likewise are distinctly visible owing to the loose set of the former. The wool, then, wholly, and the basal two-thirds of the hair also, is yellowish white : the terminal third of the hair black, tipped more or less largely with yellowish white ; and thus is produced the pepper and salt hue above spoken of, which becomes paler on the flanks than on the back, because the dorsal hairs are more largely and generally furnished with the large black ring than are those of the sides.

Whoever may compare this description of the colour of the Tibetan Badger with those of the English animal furnished by its describers,* will at once perceive how almost absolutely identical the tints and their distribution are in the two animals. I cannot confidently point out a single disparity except that the tail is more entirely white in the *Túm-phá* : and this is a very interesting circumstance as evidencing the intimate affinity of the two sections of the Genus, or *Meles* and *Taxidia*. From the English Badger or type of restricted *Meles*, however, our animal may be at once discriminated without referring to skulls, by its inferior size, greater length of tail, and partially clad planta or foot-sole. Of the American Badger or *Taxidia*, two are spoken of, viz. the *Carkajou* and the *Tlacoyotl* : but of these the former alone, I believe, yet finds a place in scientific works, and it is distinguished from its Asiatic analogue, the *Túm-phá*, by the following external marks, none of which belong to our animal : belly and throat white : dark vertical bar down the cheek : two more longitudinal ones running from the muzzle to the mid-back, where they meet, enclosing all the way a white space : tip of the tail black.

* See Note, *Libr. VII.* 148, and *English Règne Animal II.* 271.

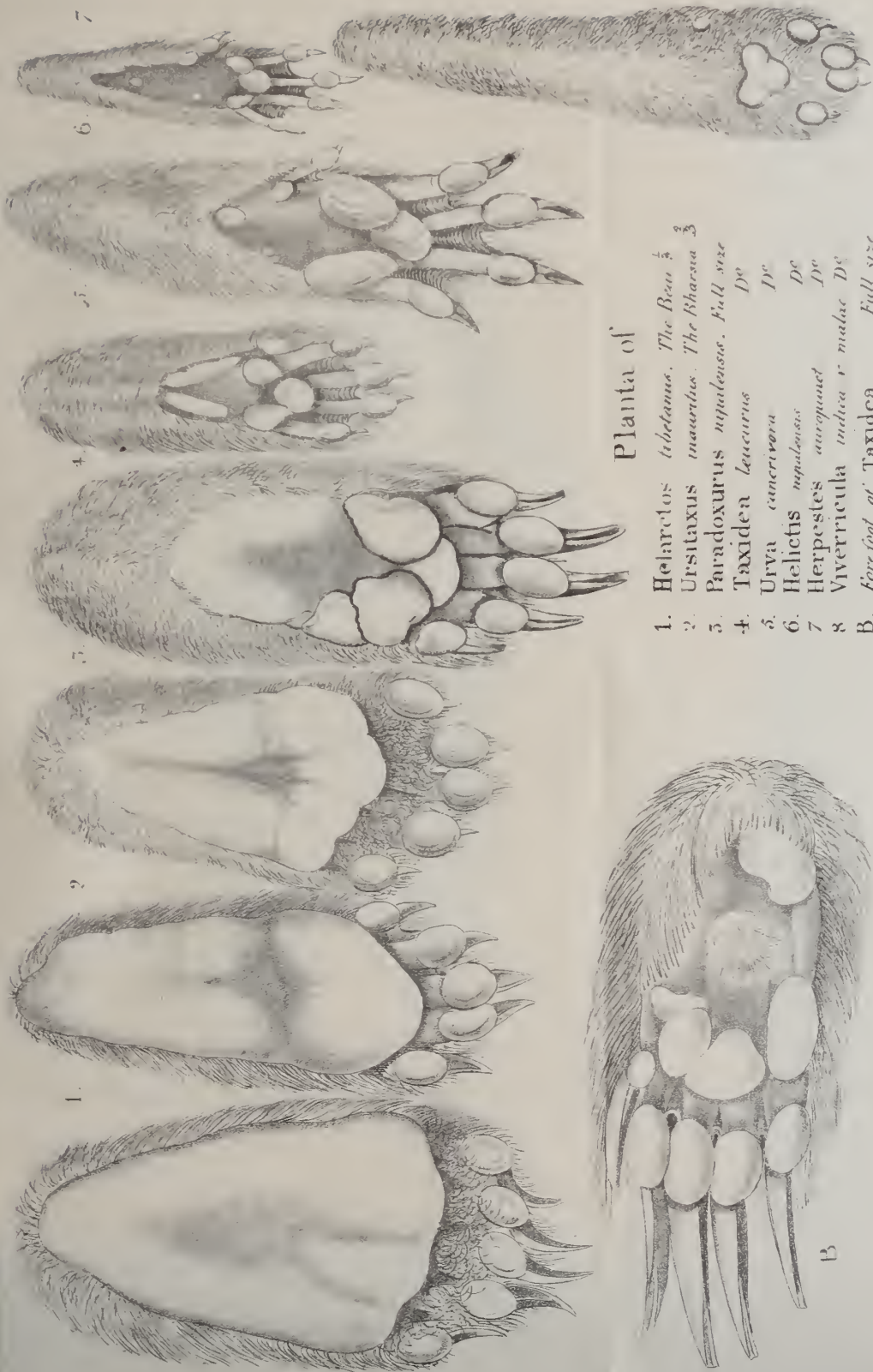
Such being the marks of the only other known species of *Taxidia*, there can be no doubt our species is new; and I fancy that Zoologists will hail with surprise and pleasure the discovery of an emphatically occidental type in the remote east. Very beautiful illustrations of our animal, from the pencil of my Newar artist, accompany this paper; and, as the *Túmpha* belongs to a group of animals dubiously suspended, as it were, between the *Digiti* grades and *Planti* grades, occasioning infinite debate, I add to the other illustrations of my paper a comparative series of views of the feet of such of these forms as belong to *Himáláyan* Zoology, and are mostly recent discoveries. These are *Ursitaxus*, *Helictis*, *Urva*, *Herpestes* and *Paradoxurus* and *Ailurus*; to which I add of course *Taxidia*,* and *Helarctos* and *Viverricula*, as illustrative extremes, merely of the other and medial forms.

Dimensions of the Tibetan Badger.

(FEMALE.)

Total length from snout to end of tail tuft,	3	1	0
Snout to vent,	2	3	0
Head to occiput, straight,	0	5	$\frac{1}{2}$
Snout to foreangle of eye,	0	2	$\frac{1}{8}$
Thence to base of ear,	0	2	$\frac{1}{8}$
Tail and hair,	0	10	0
Tail only,	0	7	0
Girth behind shoulder,	1	6	0
Palma and nails, longest,	0	3	$\frac{1}{8}$
Planta and nails, from os calcis,	0	4	0
Planta only, or nude rest of foot,	0	2	$\frac{1}{2}$
Longest forenail,	0	1	$\frac{1}{8}$
Length of hair on body,	0	4	$\frac{1}{4}$
Length of wool,	0	2	0
Length of ear, less tuft,	0	1	$\frac{1}{4}$
Length of ear and tuft,	0	2	0

* I have not met with *Mydaus* or *Aretonyx* or *Aretictis* in these regions, and I fancy that Duvancel's authority for the last in *Bhútán* Vel *Deva Dharma*, is erroneously quoted like mine. The alleged identity of *Ursitaxus* and *Mellivora* is yet open to doubt: nor is it by any means certain that the species tenanted the plains of Hindosthan, the *Bijn* is the same as the highland animal or *Bharsia*. Some of the above details of *Taxidia* will, I fear, prove tedious reading. But the type is rare and he who has it not before him can judge its characters, especially those of the skull, solely by means of such minute description.



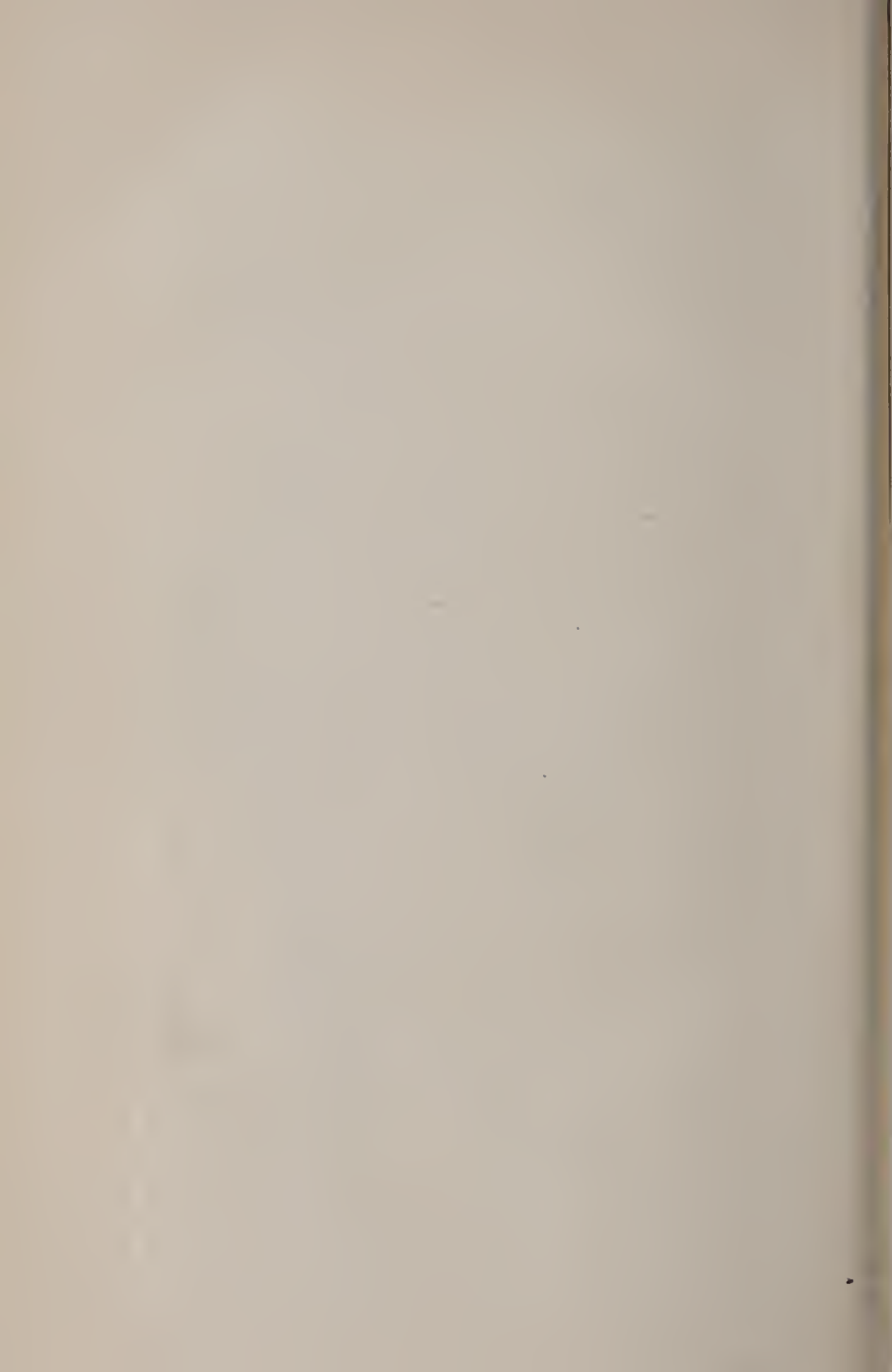
Plantae of

1. *Helarctos tibetanus*. The Bear $\frac{1}{2}$
2. *Ursitaxus ussuricus*. The Bhasia $\frac{3}{4}$
3. *Paradoxurus nipalensis*. Full size
4. *Taxidea leucurus* Do
5. *Ursus arctos* Do
6. *Helictes nipalensis* Do
7. *Herpestes auropunctatus* Do
8. *Viverricula indica* r. malae Do
- B. Forefoot of *Taxidea* Full size



HYSTRIX alcephus (Hodgson)

1 Black. Asiatic Leth. Tropical



SKULL.

Length of intermax to occipital crest,	0	5	0
Width of, between zygomæ,	0	2	$\frac{11}{16}$
Width, greatest, between parietes,	0	2	0
Height, greatest,	0	2	0
Length of upper jaw, to end of teeth,	0	2	0
Lower jaw ditto ditto	0	2	0
Greatest width between upper molars,	0	1	$\frac{1}{2}$
The same, lower molars,	0	1	$\frac{3}{16}$

On a new Species of Porcupine.—By the same.

• GLIRES VEL RODENTIA.

HYSTRICIDÆ.

HYSTRICINÆ.

Genus Hystrix.

Species new, II. *alophus* (*alpha* primitiva et *lophos* a crest.)

Crestless Porcupine.

Anehótia Sâhi vulgo.

Habitat Sub-Himálayas.

It has often been surmised that there are two species of Porcupine in India, but I am not aware that any one has yet discriminated the second and rare species from the common one, or *Leucurus*. My hunters have just brought me a fine old male of the second species above adverted to, and I propose now to give a description of it, for it is very evidently distinguishable from the common species both of Europe (*eristata*) and of India (*Leucurus*) by its inferior size, by the total absence of crest on its head or neck or shoulders, by its longer tail,* by the white collar of the neck being evanescent, and lastly, by the inferior size and smaller quantity of the spines or quills.

The crestless Porcupine of the sub-Himálayas measures 22 to 24 inches from snout to vent, and stands about 8 inches high. Its weight

* European species 3 feet long and tail but 4 inches.—Cuv. III. p. 205): *Leucurus* still larger? Its tail all white and its crest reaching to base of tail.—(*Zool. Jour. July*, 1831, p. 103.

is from 16 to 20lbs. Girth behind the shoulders 18 inches. Head to the occiput $5\frac{1}{2}$ inches. Tail only 4 inches. Tail and hollow quills, $5\frac{1}{2}$. Ear to the fore base $1\frac{1}{4}$, to crown, 1. Elbow to wrist $3\frac{5}{8}$. Palma and nails $2\frac{5}{8}$. True knee to os calcis $3\frac{3}{4}$. Planta and nails $3\frac{3}{8}$. The structure is typical, or precisely similar in all its details to that of *Leucurus*, which species however is much larger, being 28 to 30 inches* long from snout to vent and 20 to 22 inches in girth behind the shoulder, and weighing 30lbs and upwards. The long bluff nose, small pig eyes, andromorphous ears, short purely plantigrade limbs, (furnished with 4 toes and a rudiment antecally, and 5 perfect toes posteriorly) and thick heavy body, give to the crestless porcupine all the ungainliness of aspect proper to his congeners, while the absence of the fine sweeping crest with which they are adorned, adds to the uncomely physiognomy another peculiar feature of dulness in this species. The head, neck, fore half of the body, and entire belly and limbs, are covered with spinous bristles which have a pretty uniform length of from 2 to 3 inches, but are shortest and feeblest on the head and limbs. The hinder part of the body, or croup and tail, only, are armed with true quills of which the longest thick ones are about 7 inches, and the longest thin ones, about 12 inches. The tail is conico-depressed, thick and but one-sixth of the animal's length. Its longest thick quills are 3 to 4 inches; and its longest thin ones, 5 to 6 inches. The rattle at the end of the tail consists of 35 to 40 hollow cylinders of about an inch in length, some of which are closed and some open at the distant end. The skin of the body is pure white. The iris brown. The nudish lips and nude soles of feet, fleshy brown. The spinous bristles black, save on the head, where they are less deep-hued, passing to brown. The white collar is very narrow and vague. The quills white with *but one* subcentral black ring; those of the inferior surface (only) of the tail, being all white, and the like marginally round the anal and genital organs: the nails brown horn. Every part of the body is covered with the appropriate vestiment save the mere anal and genital

* "If Col. Sykes be right as to the size of *Leucurus*, the common sub-Himalayan species, called *nepalensis* by me is certainly distinct and nearer to *cristatus*. It has the upper surface of the tail black laterally and white centrally, forming three conspicuous lines of colour on the upper surface. The tubes are all white and so is all the under surface."

organs, which are nude. The anus is large and tumid, being almost entirely surrounded, just within the sphincter, by two rope-like glands, whose extremities nearly meet on the mesial line above and below. The secretion of these glands is puss-like but void of odour good or bad, and is carried off by several palpable pores placed in close apposition with the glands and of which 4 larger and 6 smaller ones may be plainly traced round the margin of the anus. The penis is sheathed as in the dogs, but is directed backwards, pointing ordinarily to the anus, and is furnished with a cylindric bone $1\frac{1}{4}$ inch long. The testes are internal. The teats are 8 and are costal, or placed upon the ribs or flanks. The very large incisors are nut-brown. The molars, which are 4 on each side, above and below, have perfectly flat crowns, hardly raised above the level of the gums, and whose surface is transversely marked by a triple fold of enamel, like three or four bits of thread with the ends* brought together and the sides approximated curvewise, pretty much as in the Beaver, according to Cuvier's* delineation. The intestines are $30\frac{1}{2}$ feet long. The Cæcum, about 11 to 12 inches long and $2\frac{3}{4}$ wide, is placed 6 feet from the anal end of the gut, and is saccæd and banded, as well as 27 inches of the intestinal canal below it. This cœciform part of the gut has the same width as the cœcum itself. The small gut has an average width of $\frac{3}{4}$ inch, and the great gut of $1\frac{1}{2}$ or double.

The hemispherical stomach has the upper orifice opening centrally, and the lower, terminally, and with a well defined neck. The greater arch of the stomach is 18 inches, the lesser (between the orifices) 1 to 2 inches, exclusive of the neck just spoken of. The stomach is membranous.—Poreupines are very numerous and very mischievous in the sub-Himálayas where they depredate greatly among the potatoe and other tuberos or edible rooted crops. They are most numerous in the central region, but are common to all three regions. They breed in spring and usually produce two young about the time the crops begin to ripen. They are monogamous, the pair dwelling together in burrows of their own formation. Their flesh is delicious, like pork, but much more delicate-flavoured, and they are easily tamed so as to breed in confinement. All tribes and classes, even high caste Hindoos eat them,

* *Regnè Animal*, Vol. III. p. 96.

and it is deemed lucky to keep one or two alive in stables, where they are encouraged to breed. Royal stables are seldom without at least one of them. The Parbattiahs call them Dumsi; the crested one, chotia Dumsi; the uncrested, anchotia* Dumsi. The Lepchas and Limbus of Sikim do not distinguish the two species, but call both Sathung and O'—é, in their respective languages. The subject of the above description is the uncrested species, and I have only to add that its manners, like its structure, are closely assimilated to those of the white tail or *Leucurus*; but that it is much rarer than the latter.

The following are the dimensions of a fine old male of our present animal, which I have denominated *Alophus* to mark the absence of that conspicuous crest which distinguishes the common species both of this country and of Europe.

Snout to vent,	1	11	$\frac{1}{2}$
True tail,	0	4	0
Tail and tubes,	0	5	$\frac{1}{2}$
Tail and long quills,	0	8	$\frac{1}{2}$
Head to occiput,	0	5	$\frac{1}{2}$
Snout to eye,	0	2	$\frac{3}{4}$
Eye to ear,	0	1	$\frac{7}{8}$
Ear from lobe,	0	1	$\frac{1}{4}$
Ear from crown,	0	1	0
Mean height,	0	8	0
Girth of chest,	1	6	0
Elbow to wrist,	0	3	$\frac{5}{8}$
Palma and nails,	0	2	$\frac{5}{8}$
True knee to os calcis,	0	3	$\frac{3}{4}$
Planta and nails,	0	3	$\frac{3}{8}$
Longest quill,	1	0	0
Weight,	16 $\frac{1}{2}$ lbs.		

* Anchotia exactly — *Alophus*, and Chotia — *Cristatus*.

Rough Notes on the Ornithology of Candahar and its neighbourhood.

By Capt. THOS. HUTTON.

[*With some Additional Information on the Birds of Afghanistan.*—

By E. BLYTH, Curator of the Asiatic Society, &c. &c.]

1. *Falco* [*peregrinus*, L. Young male].*
2. *F.* [*subbuteo*, Lin.] These birds are found around Candahar, but did not seem to be common.
3. *F. aesalon*, Lin. The Merlin occurs also at Candahar.
4. *F. tinnunculus*, (L.) The Kestrel. (The "yellow iris" was so recorded on the wrapper of the male specimen when it came from Afghanistan, but whether upon my own authority, or that of some friend, I do not remember).
5. *Circus cyaneus*, (L.) The Common Harrier. This is rather a common species at Candahar, and frequents the marshy tracts below the city to the south, where, during the winter, Snipe and water-fowl are abundant. I saw them also at Girishk.
6. *C. aeruginosus*, (L.) Also common at Candahar, especially near a small swamp to the south of the city, and along the banks of canals in the cultivated tracts;—one or more might usually be seen sitting on a stone or clod of earth, watching and peering round them, and taking occasionally a leisure sweep above the marsh plants and crops.
7. *Accipiter nisus*, (L.) Common at Candahar.
8. *Nisastur badius*, (Lath.) Not uncommon.
9. *Aquila bifasciata* (?), Gray. A single specimen of what I believe to be this species was captured at Girishk in the month of December. Unfortunately, I took but a scanty memorandum at the time, and did not obtain a second specimen. "Plumage dark brown, two cinereous bands on the wings; feathers lanceolate on head and neck; cere yellow, as also feet; claws and bill black.
10. *Milvus ater*, (Lin.) The common Indian Kite or *Cheel* was seen throughout the summer in abundance, became scarce about November, and disappeared as winter set in. They returned early in spring, and

* The "Churk" Falcon, killed near Ghuzni by Mr. Vigne ('Personal Narrative of a visit to Afghanistan,' &c., p. 136), is not the Churgh or 'Cherrug' (*F. tinnunculus*, v. *F. cherrug*, Gray), but apparently a young Peregrine.—E. B.

the young were once brought to me in the end of May, scarcely fledged ; this is curious, as at Neemuch the Cheel breeds in December and January.

11. *Gypaëtos* [*barbatus*? *G.*] *himachalanus*, nobis. This bird is identical with that which is so common throughout the Himalaya mountains, and possesses the dark pectoral band observable in the latter, and which (from its not being mentioned as characteristic of the European species) has led me to entertain doubts of its being the true *G. barbatus*.—They were common throughout the whole of Afghanistan, and were first seen soaring over the rocks of the Bolan Pass ; they were again met with around Candahar, and at Girishk on the Helmund.—I never saw a single mature individual either in the Himalaya or in Afghanistan without the pectoral band, as you tell me is the case with Burnes's figure of an Afghan specimen.

12. [*Gyps bengalensis*, (Shaw) :] *Vultur leuconotus*, Gray, in Hardwicke's 'Illustrations.' This bird was not uncommon around Candahar during the summer months, but departed as the winter approached. I saw it also at Girishk on the Helmund.

13. *Neophron percnopterus*, (L.) Common also during the summer, but departed in autumn.*

14. [*Bubo bengalensis*, (Franklin).] Not uncommon among the rocks near Candahar ; the yearling specimen sent was brought to me when only covered with down, and was fed with raw meat, and kept in a box till I left Candahar, when I killed and skinned it, but before it had attained its full plumage.

15. *Otus vulgaris*, Fleming. Common at Candahar.

16. *O. brachyotus*, (L). This and the last were common among the ruins of the old city of Candahar, about three miles from the modern town ; it was ruined by Nadir Shah.

17. *Ephialtes* [*lettia*?, Hodgson]. This did not appear to be plentiful, as I only saw one specimen ; it was identical with one common at Neemuch and Bareilly, but whether it be so with the European *scops* I cannot say, as my specimen is lost.

18. *Athene bactrianus*, mihi, n. s. ? [*Strix persica* (?) Nour. Dict.

* The three last mentioned species were seen on the 1st of March, two stages south of Candahar. The *Gypaëtos* made the Vultures quit their prey.

Hist. Nat., VII, 26.* Length about 9 inches ; of wing $6\frac{1}{4}$ inches, and tail $3\frac{1}{2}$ inches : tarse $1\frac{1}{4}$ inch. Plumage of the upper-parts somewhat rufescent clay-brown, with large round white spots on the feathers, more or less concealed, and wholly so on those of the middle of the back : coronal feathers with medial whitish streaks : face white ; some of the radiating feathers on the sides of the beak terminating in black vibrissæ : chin, throat, lower tail-coverts, and the tibial and tarsal plumes, white, also the fore-part of the under-surface of the wing : a longitudinal broad streak on each feather of the breast and abdomen : on the hind-neck, the white so predominates upon the feathers as to give the appearance of a half-collar : the great wing-feathers have broad incomplete pale bands, disposed alternately on their two webs ; and the middle tail-feathers have a double row of semi-alternating pale spots, passing into dull bands on the outer tail-feathers : beak (in the dry specimen) whitish ; and claws pale horn-colour]. . Common among the rocks and ruins of old Candahar.

19. *Upupa epops*, Lin. The common Hoopoe. ‘Hoodhood’ of India.—This bird was scarce and only a summer visitor. I saw it, however, in the valley of Pisheen on the 6th March, when returning to this country.

20. *Coracias garrula*, Lin. This bird is very common during the summer months, but departs by the end of autumn : it arrives at Candahar in the middle of April. [Burnes obtained it in the Moultan]. Persian—“Subz Kullag ;” Pushtoo—“Sheen Tootee.”

21. *Alcedo ispida*, Lin. Found on the banks of rivers all the year through.

22. *Merops apiaster*, Lin. European Bee-eater. These birds appeared at Candahar in the beginning of April, and left in the beginning of autumn.

23. *M. persica*, Lin. These came in with the last. [Two specimens in the Society’s collection were obtained by Sir A. Burnes at Buhawalpore.]

24. *Cuculus canorus*, Lin. My specimens were shot at Quetta in April. The variety, *C. hepaticus*, was also obtained there in the same month.

* The work cited is not accessible here ; but I have some impression that the species referred to is a small *Athene* (v. *Noctua*),—E. B.

25. *Cypselus apus*, (L.) Common Swift. As in England, this bird is later in appearing than the Swallow, and departs before it. It is common during the summer, coursing and screaming as they chase each other rapidly through the air. They were first seen on the 20th February [!].

26. *Corvus corax* (?), L. The Raven. Very common in Afghanistan, especially during the winter. I have marked it doubtful, because I have no specimen to refer to, but all its measurements, &c., agreed with Fleming's description; "Kargh."

27. *C. frugilegus*, L. The Rook. Found in large flocks during winter in Candahar, searching for food in the ploughed lands. The base of the bill is denuded as in the European bird.—They arrive in February, which is there the coldest month, and depart in March.

28. *Fregilus graculus*, (L.) The Chough. This is abundant during the winter months, arriving in November from the hills to the northward, and departing again about March. At Girishk on the Helmund they sometimes appear in hundreds about sunset, coming from the hills when the heats of day are passed, and settling among the swampy beds along the river, where they procure abundance of mollusca. Called 'Tsagh.'

29. *Pica caudata*, (L.) European Magpie. Is found all the year round from Quettah to Girishk, and is very common.—They breed in March, and the young are fledged by the end of April. The nest is like that of the European bird; and all the manners of the Afghan Magpie are precisely the same; they may be seen at all seasons. [The measurements of an Afghanistan Magpie are given in XV, 26. Capt. Hutton's specimen is larger, the wing of it measuring $8\frac{1}{4}$ inches, and the tail 1 foot; but, on comparing it with several European specimens, there can be no doubt of the specific identity.*]

* The wing of Capt. Hutton's specimen is thus as long as that of my *P. media*, XIII, 393; but the latter species is distinct, and seems to be identical with Mr. Gould's subsequently named *P. sericea*, Proc. Zool. Soc. 1845, p. 2, from Chusan. I was positively assured that *P. media* was shot in the Chilian Andes; but as some Macao birds were purchased with the S. American collection which yielded *P. media*, I strongly suspect that these were not, in all instances (vide note to p. 471, ante), kept so distinct as was asserted, but that two or three of them had become mixed up with the S. American specimens. If I am right in this conjecture, there are now before me three well marked species of Asiatic Magpies,—viz. *P. bottanensis*, Ad Delcserst, (v. *megalopectera*, nobis,) *P. media*, nobis, (v. *sericea*, Gould,) and the European *P. caudata*, (L.), from Afghanistan.

30. *Sturnus indicus*, Hodgson [*vulgaris*, Lin.] Arrives in the winter months only, and departs in spring.

31. *St. unicolor*, Marmora. These were far more numerous than *St. indicus*, and inclined to keep separate from them; the flocks being sometimes without a single spotted bird among them. Of five specimens in my possession, *all* are like those I send for inspection, but in life the bill is brown, not yellow. *St. indicus* remains only during the coldest months and departs as spring approaches; whereas the present species builds in the spring at Candahar, laying 7 or 8 blue eggs, and the young are fledged about the first week in May.*

32. *Pastor roseus*, (L.) 'Goolabi Mynah' of India. These birds arrive at Candahar in immense flocks in the spring, but disappear with the mulberries which they devour greedily. Their stay is very short. [The same is remarked by Vigne, who, from observation, states it to visit Persia, Afghanistan, and parts of India, in the mulberry season.]

33. *Passer indicus*, Jardine, and Selby, [p. 470, ante]. Common in Afghanistan, and does not differ from the Indian Sparrow.

34. *P. [hispaniolensis*, (Tem.)!] Is found all the year through, and builds both in houses and trees. I formerly mistook this for the Tree Sparrow, *P. montanus*, (L.) [The occurrence of this N. African Sparrow, and of *Sturnus unicolor* (another common species of Barbary), in Afghanistan, is exceedingly remarkable: but I am as satisfied of the correctness of these identifications as can be, without actual comparison with African specimens.]

35. *Gymnoris [petronius*, (L.)] Arrives at Candahar in the latter end of April, and departs in autumn; it was far from common there, though probably among the gardens on the Helmund they were more plentiful. It frequents trees [like *G. flavicollis* of India].

36. [*Carpodacus crassirostris*, n. s. (p. 476, ante).] Found at Quetta in spring.

37. *Carduelis caniceps*, Vigors. Common at Quetta and Candahar in winter and spring.

38. [*Loxia curvirostra*, (L.) Of this I have seen a living specimen, besides skins, from Afghanistan.]

39. *Emberiza [icterica*, Eversh.] This bird arrives at Candahar in

* Vide Mr. Drummond's Notice of this species in Barbary.—*Ann. Mag. N. H.*, XVI, 104.—E. B.

the beginning of April, and departs in autumn. It is likewise seen in considerable flocks at Neemuch during summer.

40. [*E. Buchananii*, nobis, XIII, 957.] Found at Candahar in summer.

41. [*Melanocorypha torquata*, n. s. (p. 476, ante).] This bird is a winter visitor, and is said to come from Bokhara: the Afghans keep them in cages.

42. [*Alauda arvensis*, (?), L. A bad figure among the 'Burnes drawings' seems to refer to this species, as occurring in Afghanistan. Mr. Hodgson sent it from Nepal, by the name *A. dulcivox*.]

43. [*Calandrella brachydactyla*, (Tem.)] Found in flocks at Candahar in winter.

44. *Certhilauda chendoola*, (Franklin;) referred by Mr. G. R. Gray to *Alauda cristata*, Lin. Very common during winter in Afghanistan and Seinde: it is likewise abundant in all the north-western provinces of India.

45. *Motacilla alba* [vera], Lin. Found during the spring months.

46. *M. boarula*, Lin. Not uncommon at Candahar during the autumn, winter, and spring months; but departs when the great heats of summer set in.

47. *Budytes citreola*, (Pallas.) Winter and spring.

48. *B. melanocephala*, Savi. In spring also.

49. *Myiophonus Temminckii*, Vigors. Shot in December near Candahar, and identical with the Himalayan bird.

50. *Merula vulgaris*, Ray. The Blackbird. I saw one specimen only of this bird, which was a female, agreeing in every respect with the description of the European species. It was captured in the fruit-gardens on the Argandab river, near Candahar, in December. [I also have seen a female Blackbird from Afghanistan, which I considered to be *M. vulgaris*.]

51. *Turdus atrogularis*, Tem. Dadur, Quetta, Candahar.

52. *Pratincola caprata*, (L.) Found all the year.

53. *Ruticilla tithys*, (L.) This is a common bird, and found all the year through. [*Non vidi*.]

54. *Cyanecula svecica*, (L.) Is a summer visitor at Candahar. (No red spot on the blue throat!)

55. [*Calamoherpe agricola*, Jerdon. Obtained by Sir A. Burnes at Cabool.]

56. *Lanius excubitor*, Lin. Is very common around Candahar. This, and not *L. lahtora*, is the bird I formerly mentioned as seizing the *Mustela sarmatica* by the nose (vide XIV, 348, on Afghan mammalia). It is chiefly seen in winter.

57. *Lanius erythronotus* [affinis]. Is also common at Candahar. [Two specimens forwarded by Capt. Hutton resemble *L. erythronotus*, Vigors, in size, but *L. caniceps*, nobis (XV, 302), in colouring.*]

58. *Hirundo rustica*, Lin. Chimney-Swallow. Was first seen on the wing at Candahar on the 8th February, 1840, and 5th February, 1841. —They are abundant throughout the summer months, and build in the open rooms, in temples, &c. They retire in October. The advent and departure both depend upon the mildness of the seasons, so that they are sometimes later, sometimes earlier, than above stated. It is identical with the English Swallow. I have seen them on the wing when the thermometer stood no higher than 36°. —On the 8th February, 1840, when I saw the first Swallow of that year, there had been hard frost and ice during the night, but the morning was fine and sunshiny. On the 16th of that month, the thermometer stood at 38°, and on the 17th again at 36°; yet Swallows were twittering and on the wing, coursing after insects, which are abundant at that season. This fact however would seem to argue that migration does not take place with these birds so much from a dread of encountering cold, as because their natural food begins to fail them in the autumnal season. But where do they migrate to, for we have them at Candahar precisely at the same seasons as in England? Do they travel to the Eastern Isles, or to the regions of Southern Africa, or where?† I have seen another species at Mussoorie also on the wing on the 20th February, 1842, when frost and ice were on the ground, though the morning was fine and sunshiny.

59. *H. riparia*, (?) Lin. A small grey Swallow was seen near Quetta in March; I observed several on the wing, near the western entrance of the Bolan Pass,—greyish-brown above, white beneath; tail squared. Apparently less than *H. urbica*. [Specimens of *H. riparia* (vera) are sent by Captain Hutton from the banks of the Sutlej.]

* *L. caniceps* occurs abundantly in the same localities as *L. nigriceps*, Franklin, and without intermingling, so far as I have seen, and the latter occurs together with *L. erythronotus* in the sub-Himalayan region; but Lord A. Hay procured a specimen at Benares (XV, 303), which is just intermediate to *L. erythronotus* and *L. nigriceps*.—E.B.

† I have never seen *H. rustica* (vera) from the Oriental Archipelago.—E. B.

60. *Sitta*—? Of this I never obtained a specimen, although they were exceedingly common among the rocks behind the old ruined city of Candahar; they frequented rocks, however, and not trees, and I venture to term it a Nuthatch on account of the similitude in plumage, size, shape, and motions;—the bill appeared to be short, strong, pointed and black; the upper parts light slaty grey-blue, with a black stripe through the eye from the forehead or base of bill; under parts buff or ferruginous white. With the exception of appearing larger, it is very like a Nuthatch we have seen at Mussooree. [Temminck, if I remember rightly, gives a *S. saxatilis*, from Eastern Europe.]

61. *Tichodroma muraria*, (L.) This beautiful little bird was very common on the rocks near Candahar, and in other parts of Afghanistan. It is identical with the European and Himalayan birds.

62. *Malacocercus* [*Huttoni*, n. s. (p. 476, ante.)] Common.

63. *Columba intermedia*, Strickland. Common blue Pigeon. Abundant; breeding in wells and ruins.

64. *Turtur risorius*, (L.) Common during the summer.

65. *T. suratensis*, (Lath.) Common during the summer.

66. *Phasianus colchicus*, L. This specimen was sent to me from Herat, by Lieut. North of the Bombay Engineers: it is said to be not uncommon in the neighbourhood of that city. [Unfortunately, it is not a typical example of its race; having much white upon its wings (which have been clipped short), and a considerable proportion of the rest of its plumage resembles that of an old or barren English hen Pheasant, that had thrown out the masculine plumage, as is not unfrequently the case: the more perfectly formed feathers proper to the male sex resemble those of an English cock Pheasant; and the rich bronze-rufous of the rump and upper tail-coverts is wholly unmixed with green. The size is that of an English hen bird; but the spurs on the tarsi resemble those of a young cock.]

67. *Tetraogallus* [*caucasicus*, (Pallas), apud G. R. Gray: *T. himalayanus*, G. R. Gray; *T. nigellii*, J. E. Gray. These fine birds are common in the Huzarrah mountains and other high ranges;—they are called *Kowk-i-durra*, or Partridge of the ghâts or passes. Sometimes they are sold in the markets of Cabool. I possessed four living birds at Candahar, which were kept with wings cut in a large courtyard, and lived well for many months. I gave them to a friend, Capt.

M'Lean of the 67th Regt. N. I., who wished to take them home to the highlands of Scotland, but he unfortunately died on his way back to India, and I know not what became of the birds. They are common on the snowy passes of the Himalaya and in Tartary, rising in coveys of 10 to 20, and usually having a sentry perched high on some neighbouring rock, to give warning of danger by his loud and musical whistle. They are difficult birds to shoot. I found them usually in patches of the [so called] Tartarie furze.

68. *Perdix?* [*Bonhami* (?), Fraser, *Proc. Zool. Soc.* 1843, p. 70. The *Seesee* Partridge: figured in the 'Bengal Sporting Magazine' for October, 1843.] Frequents rocky situations, and is abundant. The first were seen in the Bolan Pass. [Capt. Hutton has sent no specimen of this bird; but I suspect it to be the species described by Mr. Fraser, late of the Zoological Society, and which was procured at Teheran. I took the following description of the Afghan *Seesee* from some fine specimens prepared by Capt. Dunean of the 43d Regt. N. I., who brought the bird alive from Afghanistan, and kept one up to the time of his departure for England in the beginning of 1845. The figure in the 'Bengal Sporting Magazine' was taken from his living specimen.

"This seems a remarkable species, connecting true *Perdix* and *Perdicula* with *Caccabis*, and I think *Lerwa*, or the Himalayan Snow Partridge (*L. nivicola*, Hodgson): it does not, however, well range in either, though it is probable that other species will be eventually found with similar characters.* The tarse of the male are devoid of tubercles in place of spurs.

"Length about 10 inches; of wing 5in., and tail 2½in.; bill ⅝in., and tarse 1⅓in., the middle toe and claw 1¼in. Colour of male, isabella-brown above, with little trace of markings, though each feather of the back when raised is seen to have several pale dusky cross-rays; on the rump, these become obsolete or very nearly so, except along the shaft of each feather, where they assume the appearance of a series of small linear blackish spots: upper tail-coverts and medial tail-feathers minutely but obscurely mottled, the three or four outer tail-feathers

* It should be remarked that I had no opportunity of actually comparing the *Seesee* with other species. It has probably an affinity with the *Tetrao kakerlik* of Gmelin; and Mr. Fraser writes, of his *P. Bonhami*,—"This species is nearly allied to *P. Hayi*, Temm. p. c., but is readily distinguished from that bird by the black stripes about the head of the male." Mr. Fraser neglected to give the admeasurements of his *P. Bonhami*.

uniform light chesnut-brown, a little mottled at tip, and each successively more so to the middle ones. Crown ashy, the feathers brownish at tip; and cheeks and throat purer ashy, becoming albescent towards the chin: ear-coverts silky-whitish, pure white anteriorly towards the eyes, as are also the lores; and above the lores, eyes, and ear-coverts, is a black streak meeting its opposite across the forehead: the sides of the neck are mottled; the breast uniform isabella-brown, having a shade of lake, the feathers margined with faint russet; and those of the flanks may be described as whitish tinged with lake, the larger passing into black along each lateral border, and the smaller edged inwardly with chesnut-brown, and some of them with black at their extreme margin: under tail-coverts pale chesnut: primaries light dusky within, their outer web isabelline, with dusky bars and pencilings. Bill and feet pale red.

"The female is much more mottled both above and below, and is devoid of the grey on the crown and throat, of the black supercilium, and of the characteristic markings of the flanks: but there is a pale streak from the eye along the side of the occiput. Upper parts light dusky, rayed with isabelline, the darker portion of the rump feathers blackish along their shafts; the coronal feathers are similarly rayed, but present a mottled appearance at their surface; and the tertiaries are prettily variegated, presenting a series of isabelline spots along their middle: entire under-parts minutely mottled, paler on the throat and belly, and presenting on the flanks indications of the white central portion of the corresponding feathers of the male. A young chick, with pale sandy-coloured down on the head, back, and under parts, has the scapularies and wing-feathers minutely mottled sandy, with triangular pale spots on the scapularies and tertiaries, and conspicuous dark bars on the outer webs of the primaries."

This bird inhabits "rocky places covered here and there with brushwood, and feeds much on wild thyme. They are found in coveys, and when sprung, rise with a startling noise like our Bush Quails" (*Perdica rubiginosa* and *P. cambayensis*.) "Sportsmen reckon them easy to kill, and it is said that they are delicious eating. The name *Seesee* expresses their call;"* which last statement militates against the sup-

* Bengal Sporting Magazine.

position of the identity of this bird with the *Kakerlik*, which is also named from its cry.

69. [*Cucubis*] *chukar*, (Vigors). Very common among the hills. "Chowk."

70. [*Francolinus vulgaris*, Stephens, pale (individual?) variety.] This was brought to me as a true Black Partridge (*Fr. vulgaris*), but it is evidently distinct, and is probably the *Perdix pallida*, Gray, of Hardwicke's 'Illustrations.' The Black Partridge is called "Taroo" by the Afghans; but as I never saw a specimen killed during a two years' residence in the country, I am inclined to think that the bird so called is the one here alluded to. [*Perdix pallida*, Gray, is evidently a pale variety of *Francolinus pictus*, (Jardine and Selby,) or *P. Hepburnii*, Gray, as that systematist places it, viz. "*P. Hepburnii*, var. *pallida*." Capt. Hutton's bird I consider to be an analogous (and probably individual) pale variety of the female *Fr. vulgaris*.

71. *Coturnix communis*, Bomaterre. Quails arrive about the end of March, and in summer when the crops are ripening are very numerous. They are then snared in nets by the aid of a decoy whistle, and are kept singly in cages for fighting, of which sport (?) the Afghans are extremely fond, every urchin being seen with a Quail in his hand during that season. The rage for gambling is so great among the people, that instances have been known of a husband pawning his wife to pay his gambling debts, and if not punctually redeemed she becomes the property of the holder, and is either kept or sold as he pleases!

72. [*Pterocles arenarius*, (Pallas.) *Khyrgut*, or *Syah-reem*; also called *Tuturuk* in Pushtoo, expressive of the bird's cry; and *Bovra kurra*, or "black breast." Burnes figures both sexes, from Cabool: and the Society possess an Afghanistan specimen.]

73. *Pt. exustus*, Tem. Common throughout the southern parts of Afghanistan. I have seen their nests on the bare ground in August, and the young ready to fly by the end of September. They occur also in Scinde, and in the Bhawalpore (or Daoodpootra) country. "Sas-seenea."

73, a. *Struthio camelus*, L. Ostrich. This bird is said by the Afghans to inhabit the great southern desert which skirts Afghanistan and runs onward into Persia. I suspect, however, the story has arisen from the circumstance of its eggs being brought round via

Scinde from Bombay: these are hung up in tombs and mosques. None of my informants had ever seen the bird. Called "Shootur-moorgh," *i. e.* "Camel-fowl."

74. [*Houbara Macqueenii*, (? Gray.)] These handsome birds are common on the bare stony plains of Afghanistan, and sometimes occur in small packs of five or six together. They fly heavily, and for short distances, soon alighting and running. They remain all the year. [The "Dugdaoor," or Afghan Bustard. According to Burnes, "one foot nine inches high, and forty-two inches from tip to tip." It essentially resembles *H. Macqueenii*, Gray, of the outskirts of the Scindian and other deserts of western India, except in the particular of possessing a remarkable crest; falling under the subdivision *Houbara* of the Prince of Canino, which is distinguished by the splendid ornamental tufts that adorn the sides of the neck in both sexes, by the shortness of the legs, &c. The only other known species is the *Otis houbara*, auct., of Spain and Barbary, now ranging as *H. undulata*, (Gm.)

A superb male, kindly lent to me some time ago, by Capt. Duncan, measured about 30in. in length, of which the tail measured 10in.; wing $15\frac{1}{2}$ in.; bill to forehead $1\frac{1}{2}$ in., and to gape $2\frac{3}{8}$ in.; tarse $3\frac{3}{4}$ in. Head beautifully crested, a series of lengthened slender feathers rising along the central line of the forehead and crown, and continued to the occiput; the foremost of them shorter than those immediately following, which latter to above the region of the eyes measured 3in. and upwards in length, and were remarkably firm in texture towards their base, and moderately so near the tips, while those behind them to the occiput, where they gradually diminish, are of much softer and hair-like texture, with disunited webs: these latter are wholly pure white; and the former are white, with the terminal fourth black and soft, the foremost of all having their extreme tips mottled buff, like the shorter and ordinary feathers directly above the base of the bill. The sides of the neck have also handsome ornamental tufts, divided like the crest into two series: a broad band of silky black feathers (from $1\frac{1}{2}$ to 2 inches long) commences below the ear-coverts, and extends for some distance down each side of the neck, and behind the lower half of this is thrown out the first or upper series of beautiful neck plumes, which are 6in. long, and have the basal two-thirds white, with scanty hair-like disunited webs, and their terminal portion expanded and spa-

tulate, of a glossy black colour, with connected webs; the second and larger series being still longer and wholly white, the feathers soft and dense, straight, or rather a little curved inward, and very fine and flexible. Upper-parts pale buff, albescient upon the wing-coverts, and a little so elsewhere; somewhat deeper about the middle of the back, and much deeper on the tail and its upper coverts, which nearly resemble in colour the upper-parts of *O. tarda*: all being delicately and minutely pencilled with black, and having a subterminal mottled black band, and one or more similar additional bands, (according to the size of the feather), which in general are concealed by the feathers which successively impend; the upper tail-coverts have narrower and less mottled black cross-bars, more or less ashy, and placed distantly apart; and the spread tail is beautifully marked with a series of ash-coloured bands, appearing from contrast bluish, all but its middle feathers being broadly tipped with cream-white. The lateral portions of the crown are minutely mottled buff and black; the cheeks are white, with black shafts and tips to the feathers; throat white; upper part of front of neck slightly ashy; and the lower portion of the neck, with the breast, are of an uniform delicate pale bluish ash-colour: rest of the lower parts white, as is likewise the under surface of the wings, but the lower tail-coverts are a little barred. The primaries are white at base, and black for the terminal half or more, extending further upon the outer web; and from the termination of the black to that of the emarginated portion of the wing, there is a slight tinge of buff: the shorter primaries and secondaries are tipped with white, together with the great range of wing-coverts; the remainder of which, as also the winglet, are black. Upon the small coverts of the wings, which are coloured uniformly with the back, but paler, a large black spot occurs, in place of the subterminal band of the dorsal feathers, but for the most part remains concealed when the plumage is adjusted: and the bars of the interscapularies have likewise a confusedly macular appearance. The bill is horn-coloured; and the legs appear to have been yellowish-green.

Of the Indian *H. Macqueenii*, an indifferent figure occurs in Hardwicke's 'Illustrations,' and it is also represented as the "Hurriana Floriken" in the 'Bengal Sporting Magazine' for September, 1833, where the only description is given of it that I have seen. "Hurria-

na," observes the writer, "has also its *Floriken*, in addition to the *Bustard* [*Eupodotis Edwardii*, (Gray,) v. *nigriceps*, (Vigors),] there numerous; but it is a very different bird from the *Floriken* of Bengal [*Sypheotides bengalensis*, (Gm.), v. *himalayanus*, (Vigors);—the *Floriken* of Southern India being the *S. auritus*, (Latham), or *Leek* of Bengal.]*** The sexes are alike, and some specimens differ a little from each other in their plumage. The drawing represents a male, which weighed 3¼lb., was 25½ins. in length, and 4ft. broad." This account being by a well known sportsman and accurate observer, the statement respecting the similarity of the sexes is entitled to all credit, as likewise that regarding the sex of the specimen figured by him: otherwise, so nearly does this Indian bird resemble that above described from Afghanistan, except (so far as hitherto appears) chiefly in being devoid of the crest, and in having the upper two-thirds of its ornamental neck plumes wholly black, that I incline to regard them as identical, presuming the crest to be merely a seasonal adornment, and that some variation in the colour of the nuchal tufts might occur in different individuals.

The only Indian specimen that I have seen was a beautiful female, procured at Hansi in the month of December, and obligingly forwarded for my inspection by Capt. Boys (of the 6th Cavalry). This measured, when fresh, "25in. in length, 4ft. in extent of wings, and weighed 3lb. 6oz.;" length of closed wing 14in., of tail 9in., tarse 3½in., and bill to gape 2½in. "Irides bright yellow: bill blackish-horny, with greyish black nostrils, the base of the lower mandible whitish: and legs greenish-yellow." This specimen agreed tolerably well with Hardwicke's figure, except that the mottled black patches on the upper parts are much smaller and more numerous, and scarcely appear at all upon the wings, which should have been coloured paler; the pencilling in front of the neck is much more delicate; and the tail is banded with light ash-colour (appearing blue), slightly bordered with black. Comparing it with the foregoing description taken of the Afghanistan specimen, I noted that the minute description of the upper-parts, wings, and tail, there given applies equally to the present bird; but "though the coronal feathers are all, in the mass, considerably lengthened, there is no indication whatever of the greatly developed, and abruptly rising, medial crest of the other, the plumes composing which are singularly

firm and wiry towards their base. The lower third of the lateral neck-tufts are white, and of similar texture in both; but the front of the neck, below the dull white throat, of the Hansi specimen is uniform pale buff, minutely freckled with black, and at its base are some lengthened plumes of a pale ash-colour impending the breast. Unfortunately, I had not the opportunity of comparing the two together, nor either of them with an Afghanistan specimen which is now likewise forwarded on loan by Capt. Hutton: but this third specimen appears to be intermediate to the other two, agreeing more with the description of the Hansi bird, but having a slight crest, or apparently the remains of a crest in process of being shed, confined to the forehead only; and there are but few traces of white upon the black or upper tuft of lateral neck plumes. I am, accordingly, more than ever inclined to regard the crest as a distinctive characteristic of the breeding season only, when it would probably be more developed in the male sex than in the female.

According to the writer in the 'Sporting Magazine,' the *Hurriana Floriken* "frequents the same country as the Bustard [*Eu. Edwardii*], or dry sandy plains where there is a little grass, and it is also found in wheat and grain fields. The native name for it is *Tilaor*. Its flesh is exceedingly tender, and is so covered with fat, that the skins are with difficulty dried and preserved." Capt. Boys, during the many years that he had collected in the Upper Provinces, never obtained more than the one specimen noticed; but in Scinde it is tolerably numerous.

75. [*Lobivanellus*] *göensis*, (Gm.) Near Quetta.

76. [*L. (?) leucurus*, (Licht.) Procured by Burnes at Cabul. Termed "Chizee."]

77. *Vanellus cristatus*, Meyer. [Termed "*Alutye*," or "*Meckhcao*," at Cabul.]

78. [*Hiaticula philippensis*, (Gm.); *Charadrius minor*, Meyer. Procured at Cabul by Burnes; and designated "Tillah Chusmuck."]

79. [*Hæmatopus ostralegus*, L. "*Teitah-wuck*" of Cabul. Also procured by Sir A. Burnes."]

80. [*Philomachus pugnax*, (L.)] Common all the year.

81. [*Tringa subarquata*, (Gm.) A nameless figure, from Cabul, among the 'Burnes drawings,' appears to refer to this species; but it

is one of the most faulty of the series. It seems, however, to be a common bird throughout Asia.]

82. *Tringa* [*minuta*, Leisler]. Shot at Candahar. [Obtained also by Burnes at Cabul.]

83. *T.* [*Temminckii*, Leisler. Also obtained by Burnes at Cabul.]

84. [*Limosa ægocephala*, (L.)] Common all the year.*

85. [*Totanus calidris*, (L.) Cabul.]

86. *T.* [*stagnatilis*, Bechstein: *T. Lathamii*, Gray; *Limosa Horsfieldii*, Sykes.] Common all the year.

87. *T.* [*glareola*, (Lin.)] Common all the year.

88. [*Numenius arquata*, (L.) Cabul.]

89. *Scolopax rusticola*, Lin. The Woodcock is very common at Quetta and Candahar, arriving in November and departing in May: they probably only retire during the summer to the more northern districts, in order to avoid the hot wind and great heats of the southern tracts at that season. A female measured, over all, 16in.; and weighed 13oz. [I have obtained two fine specimens of the Woodcock in the immediate vicinity of Calcutta, and have heard of one or two others having been shot, though at long intervals.]

90. [*Gallinago scolopacinus*, Bonap.:] *Scolopax gallinago*, Lin. Common Snipe. Abundant from Quetta to Girishk; at Candahar they gradually disappeared (or became scarce) to the beginning of April.

91. [*G.*] *gallinula*, (L.) Jack Snipe. As common as the last.

92. *Rhynchea bengalensis*, (Gm.) Also occurs at Candahar.

93. [*Falcinellus igneus*, (Gm.); *Tantalus falcinellus*, Lin. "Boozuk" of Cabul (Burnes).]

94. [*Ciconia nigra*, Belon. Procured by Burnes at Cabul.]

95. [*Platalea leucorodia*, Lin. Also procured at Cabul by Sir A. Burnes.]

96. [*Ardea cinerea*, Lin. Ditto ditto.]

97. [*Iherodias alba*, (L.)] Found all the year on the banks of the rivers.

98. [*I. garzetta*, (Lin.) Procured by Sir A. Burnes at Cabul, and with the last called *Ookar*.]

* N. B. This and *Totanus stagnatilis* were sent with the same number, and remark attached to that number.—E. B.

99. [*Ardeola minuta*, (L.)] Found at Candahar in winter, along the banks of water courses.

100. *Botaurus stellaris*, (L.) Found along the banks of the larger rivers, as the Argandab and Helmund.

101. *Nycticorax griseus*, (Lin.) Found in the winter on the banks of the larger rivers.

102. [*Grus leucogeranos*, Pallas. "Syakbal" of Cabul, where procured by Sir A. Burnes.]*

103. [*Anthropoides virgo*, (Lin.) Figured by Burnes as the "Shuck Duruck" of Cabul.]

104. [*Ortygometra pratensis*, (L.) British Corn Crake. A common summer visitor in Afghanistan, from which country specimens were brought by Capt. Duncan.]

105. [*Porzana maruetta*, (Brisson). "Teerturuk" of Cabul, where procured by Burnes.] Shot at Candahar.

106. [*P. pygmaea*, (Naum.): *Gallinula Baillonii*, Vieillot. Also procured at Cabul by Sir A. Burnes.] Shot at Candahar.

107. [*Gallinula chloropus*, L.] Shot at Candahar in winter. ["Kushkul" of Cabul, a name also applied to the next species.]

108. *Fulica atra*, Lin. The Coot was very common among the reeds and marsh plants in the ditch surrounding the old ruined city of Candahar, and in marshy places generally. It was most frequent in winter and spring.

109. [*Anser cinereus*, Meyer.] A winter visitor only at Candahar.

110. *Casarca rutila*, (Pallas.) The Brahminee Duck is found at Candahar only during the winter. ["Soorkheb" of Cabul.]

111. *Tadorna vulpanser*, Fleming. This beautiful bird is only a winter visitor. (The plate in the 'Naturalist's Library' gives it a high knob at the base of the bill, but in my specimen this is not apparent, nor is it mentioned in the letter-press of the above work).† ["Mekaz," "Alikaz," and "Shah Moorghabee," of Cabul.]

112. *Anas boschas*, Lin. Mallard. Common in winter. ["Subzurdan" of Cabul.]

* The "Sarrus" (*Gr. antigone*) was seen on the Indus, but I did not meet with it in Afghanistan.

† The base of an old Shieldrake's bill is a little raised, but not to the extent represented in the figure cited: in the dry specimen, this bulge sinks to a concavity.—E. B.

113. *A. acuta*, Lin. The Pintail Duck is also common during the winter months. ["Seik-doom" of Cabul.]

114. *A. penelope*, Lin. The Widgeon. A winter visitant at Candahar, as indeed are all these Ducks, disappearing gradually to the end of April.

115. *A. crecca*, Lin. The Teal is very common. ["Chooraka" or "Jooruka" of Cabul.]

116. [*A. querquedula*, L. The Gargany. "Seeteh-doom" of Cabul, where procured with all the other Ducks mentioned, by Sir A. Burnes.]

117. [*A. stepera*, Lin. The Gadwall. "Syah-doom" of Cabul.]

118. *Spatula clypeata*, (Lin.) The Shoveller. Very common during the winter months. [The male is thrice figured by Sir A. Burnes, as the "Kachack-nol" and also the "Aleeput," of Cabul.]

119. [*Fuligula rufiga*, (Pallas). Red-crested Pochard. "Nool-gool" of Cabul.]

120. [*F. ferina*, (L.) Dun Pochard. Male and female figured by Sir A. Burnes as the "Soorksir," and both sexes also as the "Gho-tye," of Cabul, which latter name is likewise applied to the Smew.]

121. [*F. nyroca*, (Guldenstadt.) White-eyed Pochard. Common during the winter.

122. *F. cristata*, (L.) Common. ["Sonah," and "Uhlu" (?), of Cabul.]

123. *Clangula glaucion*, (L.) The Golden-eye. Common in winter.

124. [*Mergellus albellus*, (L.) I saw only one specimen at Candahar, but heard that it was common in winter near Ghuzni. ["Gho-tye," and "Chota Khoruk," of Cabul; from which may be inferred that the large Mergansers are probably termed "Khoruk."]

125. [*Larus fuscus*, L. : *L. flavipes*, Meyer. The adult and young are figured by Burnes from Cabul.]

126. *Xema ridibundus*, (L.) Shot at Candahar, flying over a jheel south of the town.

[Two figures occur among the 'Burnes drawings' of a species of *Xema* Gull (apparently), labelled "Bad-khor," said to be "shot at Cabul in the middle of February: a bird of passage." They are, however, so unscientifically drawn, that I can hardly venture upon a description of them. The length is mentioned to have been 17 in., and alar expanse 3 ft. Adult, white, with an ashy mantle, and deep roseate

tinge on the breast; no dark spot behind the ear-coverts (as in the *Nema* group in winter colouring): the primaries are represented as black, with white terminal margins: bill and feet deep rose-red; and irides crimson,—the bill evidently represented much too slender. Young generally similar, but less pure in its colours; and the middle of the wing longitudinally, brownish, with pale edgings to the feathers; tail, also, of the young bird, dark at the end.]

127. *Podiceps* [*philippensis* and *Colymbus minor*, Gmelin]. This bird is common in the marshes and water pools south of Candahar, during the winter.

128. *Pelicanus onocrotalus*, Lin. The Pelican. Length of a specimen in my possession, 5ft. 0½in.; breadth 8ft. 11in. Bill 1ft. 2in. long; and 2½in. in breadth: tibia 4½in., feathered to within 1½in. of the tibial joint; length of middle toe 5½in.* Iris brown-red or dark blood-colour. *Skin of the face pale flesh-colour. Longitudinal centre or ridge of upper mandible, dull blue; the tip or nail, hooked, and of a blood-colour; margins red and yellowish: sides of under mandible dull blue. Pouch dull yellow; legs and feet flesh-coloured or pinkish. Plumage white, with a strong pink or roseate tinge on the head and neck; fore-part of breast dirty white: quills cinereous-black; head suberested.

These birds arrive in the beginning of March, in large flocks on their way to the eastward. The specimen from which the above description was taken, was shot in a pool of water at Candahar; it was alone, and from its emaciated state appeared to have alighted from fatigue. The Afghans, who are great lovers of the marvellous, declare that when a flock of these birds alight on a piece of water they entrust their safety during the night to a few sentries, who hover near them on the wing, wheeling around the water and keeping watch until near the dawn, when being overcome by fatigue they descend and join their sleeping companions, and from the irksomeness of their long watch are soon wrapped in a profound sleep. This is the time when the wary fowlers approach with their nets, and bearing long sticks; they then attack the panic-stricken sleepers and succeed in knocking numbers on the head before they are well aware of the danger which besets them.

* Both the Indian Pelicans, *P. onocrotalus* and *P. philippensis*, which are equally common in Lower Bengal, are subject to much variation of size.—E. B.

Several were brought in to Candahar, which had been found sitting on the rocks far from any water, and from their offering no resistance to their captors, they had evidently alighted from fatigue, and would probably have perished in a few hours. When approached, if unable to escape, they open wide the beak and strike at the intruder, making a loud snapping noise as they strike the mandibles together. I had two of these birds alive in a small tank, and have often seen them catch and swallow whole a fish of seven and eight inches in length. It is first caught within the pouch, and then thrown up into the air and caught again so as to bring the head foremost into the pouch and thus swallowed; the fins of the fish in this case are prevented from offering any impediment to its passage down the throat. They often dip the beak into the water as they sail along, and suffer the pouch to become filled with water; they then close it, and press the pouch against the breast, by which means the water is gradually expelled at the edges of the closed mandibles, and the water insects, small fish or other prey, are retained and swallowed.

It is not to be supposed that these are nearly *all* the birds of the Southern parts of Afghanistan; but my arduous duties in the Pay and Commissariat Department of Shah Soojah's force prevented my doing more than is above recorded, and you must overlook many omissions as well as scantiness of information, when I assure you that I was generally at the desk from sun-rise to sun-set!

A Description of the Glaciers of the Pindur and Kuphinee Rivers in the Kumaon Himalaya.—By Lieut. R. STRACHEY, Bengal Engineers.

The existence of Glaciers* in the Himalayas, being apparently still considered a matter of doubt by the Natural Philosophers of Europe, I have thought that some account of two most decided Glaciers, which I have just visited (May 1847) in these mountains, in about Lat. 30° 20', may not be uninteresting.

* For the benefit of those persons, who now read of a Glacier for the first time, I have in an appendix given a short account of their chief peculiarities, which I should recommend them to look at first.

As there is probably nothing specially worthy of note in these individual Glaciers, I wish to explain, that my object being to show that these phenomena exist in the Himalaya, under forms apparently identical with those observed in the Alps, it has been necessary that I should enter into details, which under other circumstances would have been superfluous. As these are the first Glaciers that I have ever seen, it is right to add, that I am only acquainted with those of the Alps, through the medium of Professor Forbes's accounts, and that as I lay no claim to originality, I have not scrupled to adopt freely the ideas, and perhaps expressions, of a person so infinitely better acquainted with these phenomena than I can be. To guard against mistakes I would also mention, that these Glaciers were selected for examination only on account of their accessibility, and that consequently no inferences should be drawn from them, of the general extent of Glaciers in the Himalaya.

The Pindur river (vide accompanying map,) is the most easterly tributary of the Bhagiruttee, or that stream of the Ganges that issues into the plains of India at Hurdwar. It rises from the south side of one of the great snowy ranges of the Himalaya, which contains the cluster of Peaks, (No. 10 to 15 of the Indian Atlas, sheet No. 66,) of which Nunda Devee* is the centre. At the head of the Pindur is one of the Glaciers I am about to describe; the other gives rise to the Kuphinee, the first considerable affluent of the Pindur.

The Pindur and Kuphinee, rising on opposite sides of the Peak called Nunda Kot, unite about 7 miles south of it. A small tolerably level space between them close to their confluence, is called Diwalee. The lower end of the Glacier of the Pindur is about 8 miles, and that of the Glacier of the Kuphinee about 6 miles above this place.

* The heights of these peaks are as follows :

No. 10	15805	English feet.	} Vide Asiatic Researches, Vol. XIII. p. 306.
11	20758	"	
12	23531	"	
13	22385	"	
14	25741	"	
15	22491	"	

No. 14, which I call "*Nunda Devee*," is the "*Jowahir*" of the Maps. "*Jowahir*" or more correctly "*Jwar*" or "*Johar*," is the name of a district (Purgunnah) which consists of the upper part of the valley of the Goree River. Nunda Devee is on the boundary of this district, and has been erroneously named after it in many maps, the word "*Johur*" being never applied to designate this particular peak, though the portion of the range in which it is, has undoubtedly been called the mountains of *Johar*.

The valley of the Pindur, at the termination of the Glacier, is about a mile across between the precipitous mountains that bound it. From the foot of the rocks on either side, its bottom slopes inwards with a moderate inclination, leaving in the middle a hollow about 300 yards wide and 250 feet deep, with very steep banks, at the bottom of which flows the river. This comparatively level space, between the central hollow in which the river runs and the precipitous sides of the valley, its surface running nearly parallel with the present bed of the river, but from 200 to 300 feet above it, can be distinctly seen for a mile or more below the end of the Glacier. The plateau itself, as well as the steep banks between it and the bed of the river, are considerably cut up by water courses running across them from the sides of the valley, but every where they have an almost perfectly rounded outline.

The whole of the bottom of the valley is covered with grass, or those species of plants that grow in these elevated regions, excepting where beds of snow, rocks, or the debris of the mountains interrupt the vegetation.

The Glacier (Fig. 2,) occupies about $\frac{2}{3}$ of the whole breadth of the head of this valley, leaving between itself and the cliffs on the east, an open grassy slope, which extends along the foot of the moraine for upwards of a mile and a half above the source of the river, and which seems to be a continuation of the plateau I before mentioned.

The first appearance is remarkable; it seems to be a vast rounded mass of rocks and ground, utterly devoid of any sign of vegetation, standing up out of a grassy valley. From the foot of its nearer extremity the river, even here unfordable, rushes in a turbid torrent out of a sort of cave, the top of which when I saw it was but a few feet above the surface of the water. The end immediately over the source of the river is very steep and of a dull black color. It is considerably fissured; the rents appearing to arise from the lower parts tearing themselves from the upper by their own weight. On a closer examination, this abrupt end proves to be a surface of ice, covered with sand and gravel, and curiously striped by the channel made by the water that runs down it as it melts. Behind this the glacier rises less steeply, like a bare gravel hill to its full height, which is probably about 500 feet above the water of the river, when it leaves the cave; in some places however are seen great fissures both vertical and horizontal, the

elevation of the
 reference

Fig 2
 elevation of the
 reference

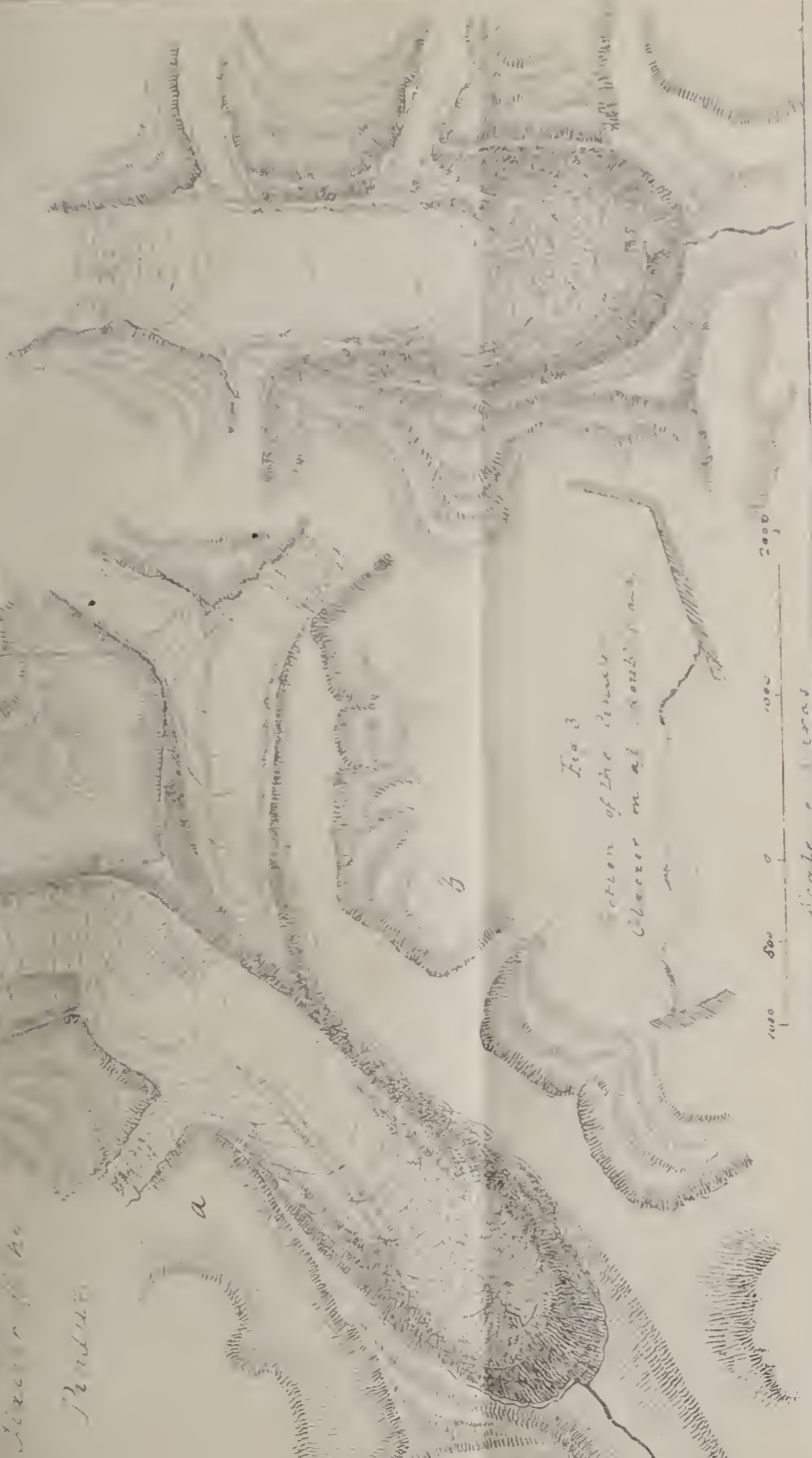
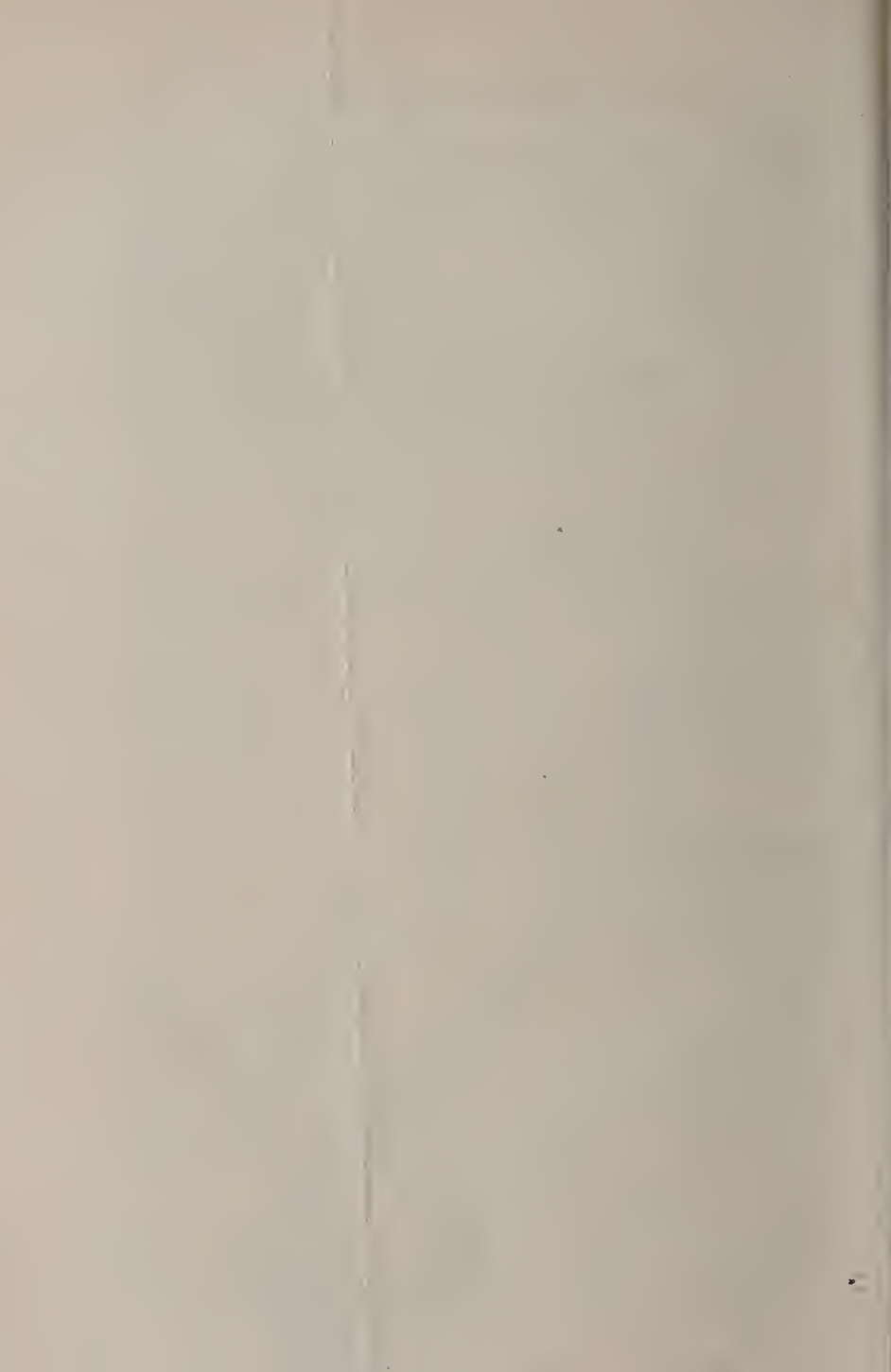


Fig 3
 Section of the River
 elevation of the reference

100 200 300 400
 feet



latter evidently made by the separation of regularly stratified layers. The last thing that might be expected of such a dismal-colored and monotonously rounded hill, is that it should be composed within of the purest ice.

The cliffs that form the immediate bounds of the valley where the Glacier lies, are of no great height; but the mountains of which they are the foot, rise many thousand feet above them, though with much monotony of appearance. Many grassy slopes are still seen considerably above the Glacier; but bare rock and snow much predominate, and are soon left in sole possession of these inhospitable regions. Two peaks* which rise, one to the N. East and the other to the N. West of the valley, probably to a height of 20,000 feet above the sea, are fine objects in themselves, and the frozen snow on their summits shines gloriously in the sun: but they are not sufficient to prevent the general impression from the scene being one of disagreeable monotony, and of desolation complete indeed, but without sublimity.

The Glacier is formed by the meeting of two ice streams, from gorges, one coming from the north-west and the other nearly from the east, which meet about 2 miles above the source of the river.

The feeder from the north-west is larger than that from the east, and its surface is at a considerably higher level, for some hundred yards below their first junction.—It descends with a great inclination, entirely filling the gorge down which it comes, in what Professor Forbes aptly terms a cascade of ice. It assumes the general appearance of a confused mass of irregular steps, which are again broken up transversely into peaks of every shape. The west side of this cascade continues nearly in its original direction, after having passed the point A, (see the sketch) below which the Glacier bends sharply to the S. W., and in this way completely crosses the Glacier. The steps in which it falls however also gradually change their direction, so as to

* The peak on the N. West is the most easterly of the three smaller peaks, which are seen from Almorah below Nunda Devee. That on the N. East, is the point at the end of the range that descends from Nundakot to the North, and appears on its left from Almorah. Between these peaks is the pass called after Mr. Trail, over which he went into Joohar, or the valley of the Goree. It is perhaps rather gratuitous to call this passage a pass, as no one has gone over it since, and certainly never will go unless from curiosity. To the right of the N. E. peak is another depression in the range, over which, I was told Mr. Trail attempted to go but failed.

remain nearly perpendicular to the general current of ice. The transition to the regular level ice is very sudden, and begins much higher up on the west, than on the east side; the sudden change of direction in the Glacier round the point, A, evidently producing much the same sort of effect in breaking the current of ice and giving it a smooth surface, as would have been observed under similar circumstances in running water. Near the foot of this ice fall, (beyond which I did not ascend the Glacier,) the steps were observed to be in the form given in Fig. 5, having their tops considerably overhanging. A small tributary, also descending in cliffs of ice, joins the main Glacier from a ravine on its east side not far above the point A. Beyond it I was unable to see owing to the sudden bend in the glacier's direction.

The feeder from the east is formed by the union of two smaller Glaciers, one coming down from the N. E. the other from the S. E.; the latter is the larger of the two, and descends in ice cliffs to some little distance below the rocky point which intercepted my view of its upper parts. The N. E. tributary is not so steep, its surface as far as I could see being continuous, excepting immediately at its union with the other, where it seems to be a good deal broken up. I did not go on to any of these Glaciers, and describe them as they appeared from the upper parts of the united Glacier.

Another small tributary Glacier also falls into the main one from the N. W., a short distance below the point A. Its inclination is very great, but it perfectly maintains its continuity of structure to the bottom.

The lateral moraine of the west side of the northern branch of the glacier is first seen as it turns the point A, where it shows itself as a black band along the edge of the ice, which in other parts of the fall is quite white. The moraine is small between the points A and the tributary glacier below it; but from this it very rapidly increases, and in its lower parts is a chaos of desolation such as I never saw before. This great addition to the size of the moraine is owing to the quantity of debris brought down by the small glacier, over the lower parts of which stones were constantly rolling on to the upper end of the moraine during the whole time we were near it. We were thus here enabled to see the actual formation of a moraine. The ice below

the junction of this tributary with the main glacier being much broken up by crevasses ; rocks and gravel from the moraines on the two sides of the tributary are scattered over the space between them, and the moraines at first sight appear to lose their distinct form ; but although there is no clear ice between the moraine that originates on the east of the tributary, and the west side of the glacier, the identity of that moraine is sufficiently marked by its color, and by the regular rise above the general surface of the glacier, of its top, which remains tolerably even for some way down, being beyond the limit of the disturbance caused by the crevasses along the edge of the glacier ; about half way down to the lower end of the glacier however, the full action of these crevasses reaches the whole of the moraine, and it is scattered or lost sight of in the general confusion of surface.

An epoch of peculiar destructiveness to the mountains passed by the glacier is marked in one part of this moraine, by an accumulation of huge masses of rock from 20 to 30 feet square, and as much as 15 feet high, and the stones found on it, are generally larger than those on any of the other moraines ; the true west lateral moraine below the tributary glacier is not very large, nor is its top much elevated above the bottom of the valley, excepting quite at its end. This is probably owing to the level of the valley on this side being higher, (vide fig. 3,) rather than to the top of the glacier being lower. The bottom of the valley slopes from the cliffs at its sides, inwards. On the east, the edge of the glacier is at some distance from the cliff and the bottom of the valley has dipped considerably where it meets. The foot of the moraine, the summit of which on that side, is high above the valley. On the west side the glacier edge is close to the cliff ; the bottom of the valley will therefore be higher. I did not notice any difference of level in the two sides of the valley.

The lateral moraine of the S. E. side of the glacier is very large. Its top rises, on an average, probably 250 feet above the bottom of the valley. Along its foot runs a stream gradually increasing in size, that collects the drainage of the open part of the valley, and of the outer slopes of the moraine. The lower part of this slope is a mass of loose stones and earthy gravel, which rolls down from above, as the face of the ice, which is visible in the upper 50 or 60 feet of the slope, melts and recedes ; this process is seen constantly going on. On the

inner side, the top of the moraine is 30 or 40 feet above the level of the clear ice of the glacier.

The upper part of this moraine comes down nearly straight from the point B. The north branch glacier being, as was before noticed, considerably higher than the eastern, the moraine slopes down from the level of the former to that of the latter, forming a deep angular depression under the point B, (when it meets the foot of the north moraine of the east glacier;) that gradually diminishes in depth up to the top of this glacier, which is here entirely covered with debris, the moraines of its two sides being scattered all over it, for some distance above its union with the north or main branch. The appearance produced by this is that the northern branch runs over the eastern, or that the latter runs into the side of the former and is absorbed by it.

The eastern tributary brings down with it moraines which require no particular remark, beyond that already made, viz. that they spread over the whole of its breadth at its extremity.

Besides these lateral moraines, is a medial one, which, similar to several described by Professor Forbes, is first seen as a dirty stripe among the white ice cliffs of the fall at the head of the north glacier. As it comes down the level ice it gradually begins to assume the decided appearance of a moraine, and increasing by degrees at last becomes very large. It continues in a well defined form for some short distance beyond where the western moraine is dispersed; but there it also is scattered over the ice, and the two become blended together and ultimately extend to meet the debris which is similarly dispersed by the eastern moraine from the opposite side of the glacier.

The whole of the moraines in the middle of the length of the glacier, where it is most regular, are very considerably raised above the general surface of the ice, which in some parts is, I should think, as much as 100 feet below the tops of the western and medial moraines. It is not to be supposed that this great elevation is caused to any considerable extent by the mere mass of rocks and rubbish collected in the moraine; it results from the ice below the mass being protected by it from external melting influences, which constantly depress the level of the clear ice beyond the moraine. On the very tops of the moraines pure ice was often seen hardly covered by the stones.

The protection given to the ice by the great lateral moraines, raises

the sides of the glacier so much that a very considerable hollow is caused in its middle, which is a striking feature in the first appearance of its lower extremity.

The ice of which the glacier is composed agrees most exactly in its nature with the Alpine Glacier ice as described by Professor Forbes. It is perfectly pure and clear, but where seen in considerable masses stripes of a darker and lighter bluish green are distinctly visible. It is composed of bands of ice containing small air bubbles, alternating with others quite free from them. In many places the surface presents a striated appearance, arising from the different degrees of compactness of these differently colored bands, and their consequently different rates of melting.

The direction of these colored veins as seen in crevasses, or in the striated surfaces of the ice, follow laws exactly similar to those observed in the Alps. The dip was most distinctly inwards, i. e. towards the longitudinal axis, and upwards, i. e. towards the origin of the glacier, in every part; the stratification being more perpendicular near the head, and more nearly horizontal in the lower parts. The direction of the strata in plan, was also very clearly marked in many parts of the ice, and was plainly in curves, having their branches nearly parallel to the sides of the glacier, and their apices directed downwards; the curvature in the centre not being at all sudden. I no where could perceive "dirt bands."

The crevasses (perhaps owing to my visit having been made somewhat early in the summer) were much less numerous and terrific than I had expected. Although considerable detours were at times necessary in crossing them, I remember no place that I thought dangerous or difficult to pass. They are developed across the direction of the glacier's length along both of its sides, commencing from the small tributary on the west side, and from the union of the eastern glacier on the other;—and continuing almost to the end, those on the west being, I think the largest. They are generally wider towards the edges of the glacier, closing up as they approach the centre. They are nearly vertical, and are directed from the sides upwards, or towards the head of the glacier, those on the west bearing nearly E. and W., those on the east bearing nearly N. and S., thus forming angles of about 45° with the axis of the glacier.

Many pools of water (the Baignoirs of the Alps) were seen on the surface of the ice ; some of the largest were said by our guides, who are in the habit of visiting the glacier, to be found in the same place every year. The clear surface of the ice everywhere assumes a more or less undulating form, from the action of the water that drains from it as it melts ; and the small streams, into which the drainage collects, end, as in the glacier of the Alps, by falling into some of the crevasses. The remains of the last winter's snow was hardly perceptible on any part of the glacier.

The occurrence of stones standing upon bases of ice (Glacier Tables) above the general surface of the glacier, is common, but all that I saw were small. I also observed what appeared to be imperfect glacier cones, or the remains of them, but these also were small.

The ice of the glacier coming into direct contact with the cliff below the point A, I was enabled to examine the effect produced upon the rocks ; I found it covered with grooves or scratches, sloping in about the same direction as the surface of the ice at the spot. These grooves extend to 20 or 30 feet above the present level of the glacier. I also observed, that almost everywhere a space was left between the rock and ice, the latter appearing to shrink from contact with the former. This was of course the effect of the heat of the rock melting the ice. I regret that an attempt that I made to measure the actual motion of this glacier proved ineffectual, owing to circumstances which it is not necessary to detail.

The valley of the Kuphinee, for a mile or two below the end of the glacier, has much the same general character as that of the Pindur, but is more rugged and desolate in appearance. A fine peak of pure snow (probably Nunda Kot, or No. 15) is seen from below the glacier, but is lost sight of behind an intermediate point, on a nearer approach.

The direction of the glacier (fig. 4) is almost due N. and South, and the whole breadth of the valley, in its upper part, about $\frac{3}{4}$ mile, is occupied by it. It commences about 2 miles above the river source, in a very precipitous fall of ice. We went up about 200 feet of the lower part of this, much beyond which it would probably have been impossible to ascend owing to the excessive steepness alone. A cliff of ice about 60 feet or 70 feet high rose immediately above the point which we reached. The ice was perfect, with the ribbon structure quite visible ; the bands

were very highly inclined, and I think farther apart than in the lower parts of the glacier. The direction of the structural lines was in no degree parallel to the sides of the glacier, but much more nearly perpendicular to them. The precise contrary of this was observed by Professor Forbes under apparently similar circumstances, in the glacier du Taléfre in the Alps.

From the foot of the fall, the surface of the glacier was on the whole very even, though its slope downwards was very considerable. It still had remaining on its upper half a good deal of unmelted snow, which was disagreeable to walk over, as it was seldom strong enough to make us indifferent to what was under it.

The main glacier is joined by two small tributaries on the east, and by one on the west; all are highly inclined and bring down considerable quantities of debris. The moraines are altogether confined to the sides of the glacier, though many small stones are scattered over every part of the ice. Here, as in the glacier of the Pindur, the protection given by the moraines to the ice on the sides raises them greatly, and leaves a deep hollow in the middle of the glacier at its end. The crevasses here also are most strongly marked near the sides, and are inclined at an angle of about 45° from the longitudinal axis, downwards. The structure of the ice is in all respects precisely as was seen in the Pindur Glacier. I am unable to offer any decided opinion as to whether these glaciers have ever varied considerably from their present limits. During the very short period of my visit to these regions, I saw no direct evidence of it. The shepherds who take their flocks to the pastures in the valleys near the glaciers during the summer months, (for there are no fixed habitations within 14 or 15 miles of them,) have no idea of any motion in the glacier, but say that they suppose the ends of them to be gradually receding. Their statements are however of a very vague nature, and as far as I could judge, are founded on their views of what ought to be rather than of what really is. Some very decided change in the state of things is however certainly indicated by the long plateaus, which I before mentioned, running for a mile or two below the present terminations of both glaciers, nearly parallel to the rivers, but several hundred feet above them. I consider it to be impossible, that these level banks above the rivers have been caused by deposits from the ravines in the sides of the

valleys, for such deposits would have had very irregular surfaces; and indeed their present effect in *destroying* the regularity of the plateaus is every where visible. Had the same appearance been noticed in any other part of the river's course, it would at once have been attributed to the action of the water at some former period; and it would have been supposed, that the bed had afterwards been excavated to its present depth. If this was the case, the glaciers while the plateau was forming, must either have terminated considerably higher up the valleys, or have stood altogether at a much higher level; in either of these ways the water could have been delivered at a level sufficiently high to form the plateau. But it may admit of doubt, whether the quantity of water in the rivers, as they are at present, is sufficient to account for such an extent of level deposit, or for such a depth of erosion of their beds; for at this great elevation they are not subject to those violent floods that occur lower down; for nearly half the year too they must be almost inert.

The only other way that occurs to me of accounting for the appearance, is that it has been occasioned by an *extension* of the glacier, and that the level top of the plateau shows the limit to which the tops of the moraines reached, as the glacier gradually receded. From the very cursory nature of my examination of the matter however I am unable to do more than point out the fact, and what possibly may have caused it.

There is another circumstance relating to these rivers which is also worthy of notice, namely, that in the upper 2 or 3 miles of their course their fall is considerably less than in the 2 or 3 miles immediately succeeding those. Thus in the Kuphinee, the average fall in the first 3 miles is about 400 feet, in the next 4 miles about 650 feet per mile; but as the average is only about 160 feet for the next 8 miles, it is highly probable that the fall in the 4th and 5th miles will be considerably greater than in the 6th and 7th. I therefore infer that it is quite possible that the fall in the 4th and 5th miles may be as much as 800 feet per mile, or even more; which the appearance of the rivers would fully justify.

Smaller extensions of the glacier of the Pindur were visible in many places. They were marked by mounds of a rounded form, covered with grass, projecting from the modern moraines in a curved direction concave to the glacier. I did not remark them at the Kuphinee.

I would here observe, that in this climate, where we are subject to periodical rains, persons should be cautious in concluding that piles of rocks in long lines are moraines, even though their edges are in no way water-worn. On both of these rivers I saw many instances of such heaps of rocks, which might very easily have been thought moraines ; and though from their immense extent, and the great size of the blocks they contain it is not easy to believe that they have been formed by the action of water, more particularly as the rocks have perfectly sharp edges and as there is often no appearance of water ever having been near them ; yet they have certainly been brought down by torrents and may be easily traced up to ravines in the mountains.

The term snow-bed having been hitherto applied by travellers in these mountains, (with one exception†) both to true glaciers, and to mere beds of unaltered snow. I will shortly explain what is meant by it when used in the latter, which is the correct sense. In many parts of the higher valleys, real beds of snow lie far below the limit of perpetual snow for the greater part of the year, and some would probably be permanent at very low elevations were they not destroyed by the rain during the rainy season. These snow beds are formed by avalanches, as is sufficiently proved by their form and position. Figs. 6, 7 and 8, represents one on the Kuphinee river, which occurs at an elevation of about 10,800 feet.

It came down from a ravine, and entirely covered the river which flowed under its whole length. The snow extended but little beyond the upper side of the ravine, but was prolonged far down the river on the lower side. Its surface was marked by curved hills, as is shown in the sketch. This is evidently precisely the form that would be assumed by snow falling down the ravine into the river. The slope of the river bed being great, the avalanche would naturally continue its course down it, after having filled the channel immediately in front of the ravine. The fall of an avalanche in the upper part of this valley gave me an opportunity of seeing the motion of loose snow in large masses ; it was very similar to that of a fluid body, the snow appeared rather to flow than to fall. So here, the snow descending through the ravine, gradually filled the river channel ; the main supply moving with the greatest

* I allude to Major Madden, who has given a short account of the glacier of the Pindur in a late number (176) of this Journal.

velocity down the middle, but sending off, all along it as it went on, particles to the sides. Its head would therefore advance in a convex curve, as the central particles moving directly forward, would always keep in advance of those that spread out to the sides. The end of the snow bed thus takes the curved form shown in the figure, and a succession of smaller avalanches, would mark its surface with numerous curves of the same sort.

In the last two miles of the approach to the Kuphinee glacier, we crossed two snow-beds, both of which were upwards of $\frac{1}{4}$ of a mile wide, and extended from the ravines in which they originated, right across the valley from side to side, entirely covering up the river.

The surface of many of the snow-beds has a sort of rippled appearance, caused by the protection given by grass and leaves blown upon the snow to the parts immediately under them. The snow itself is generally firm, and receives but a slight impression from the foot of a man walking over it.

I have estimated the heights of these glaciers from observations of the boiling point of water as follows; the results will certainly be within 500 feet of the truth.

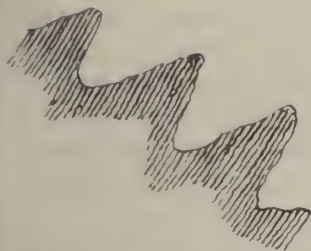
Ft. above the sea.

Lowest point of the glacier of the Pindur and source of the river	11,300
Surface of the glacier at the commencement of smooth ice...	12,000
Lowest point of the glacier of the Kuphinee and source of the river	12,000
Surface of the glacier at the commencement of smooth ice ...	13,500
Diwalee, union of the Pindur and Kuphinee	8,200

The limit of perpetual snow here being about 15,000 feet above the sea, in the one case the glacier comes down 3700, and in the other 3000 feet below it. At the Kuphinee glacier, a mass of *Rhododendron companulatum*, a shrub 6 or 8 feet high, was growing within 30 yards of the ice. There were no shrubs of any size at the Pindur glacier, but grass and flowers were at both places flourishing considerably above the level of the ice.

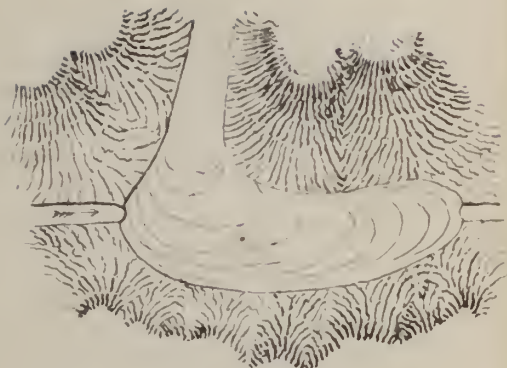
Having now concluded the record of my own observations on the two glaciers seen by myself, I will add two extracts from the Journals of travellers in these mountains, which most clearly prove the existence of two other glaciers, both of great size, one at the source of the Bhā-

fig 5



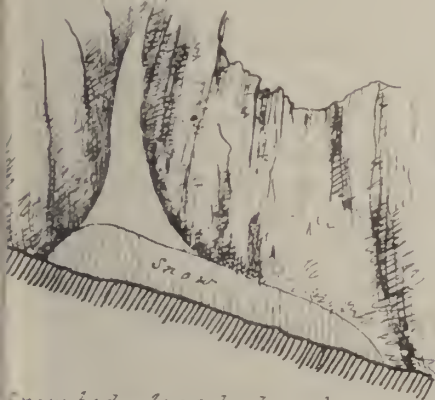
Section of ice cliffs at head of Pindur Glacier

fig 6



Snow bed - plan

fig 7



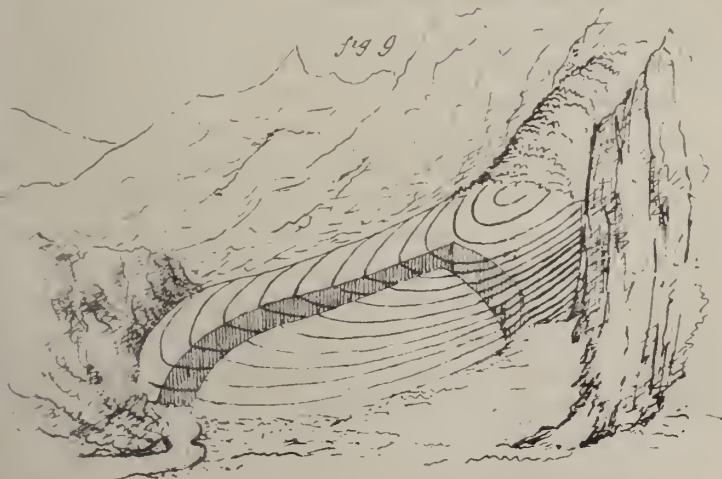
Snow bed - longitudinal section

fig 8



Snow bed - transverse section

fig 9



imaginary sections of a Glacier.



giruttee or Ganges, the other at that of the Goree, which is one of the main feeders of the Kalee or Gogra. The first extract is from a journal, by Capt. Hodgson, of a visit to the source of the Ganges, in the year 1817. (*Asiatic Researches*, No. XIV. Qu. pp. 117—128. Capt. Hodgson thus describes the first appearance of the glacier from which the rivers rises.

“The Bhagiruttee or Ganges issues from under a very low arch at the foot of the grand snow-bed,”—“over the debouche the mass of snow is perfectly perpendicular, and from the bed of the stream to the summit we estimate the thickness at little less than 300 feet of solid frozen snow, probably the accumulation of ages;—it is in layers of some feet thick, each seemingly the remains of a fall of a separate year. The height of the arch of snow is only sufficient to let the stream flow under it.”

He ascends the glacier—“This vast collection of snow is about $1\frac{1}{2}$ miles in width, filling up the whole space between the feet of the peaks to the right and left; we can see its surface forward to the extent of 4 or 5 miles or more”—“general acclivity 7° , but we pass small hollows in the snow caused by its irregular subsiding; a very dangerous place, the snow stuck full of rubbish and rocks imbedded in it. Many rents in the snow appear to have been recently made, their sides shrinking and falling in.” “Ponds of water form in the bottom of these.”

“It was remarked above, that the snow of the great bed was stuck, as it were, with rock and rubbish, in such a manner, as that the stones and large pieces of rock are supported in the snow and sink as it sinks; as they are at such a distance from the peaks as to preclude the idea that they could have rolled down to their present places, except their sharp points had been covered, it appears most likely” that they came down like snow balls with avalanches. “It is not easy to account for the deep rents which intersect this snow-bed, without supposing it to be full of hollow places.” The source of the Ganges is stated by Capt. Hodgson to be 12,914 feet above the sea.

The next is an extract from a journal of Lieut. Weller, printed as a note to a journal of Capt. Manson’s, *Journal Asiatic Society*, No. 132.

“I went to see the source of the Goree river, about a mile N. W. from Milum. The river comes out in a small but impetuous stream, at the foot of apparently a mass of dirt and gravel some 300 feet high,

shaped like a half moon. This is in reality a mass of dark-colored ice (bottle-green color), extending westward to a great distance, and covered with stones and fragments of rock, which in fact form a succession of small hills. I went along this scene of desolation for a long space, but could not nearly reach the end. Here and there where circular and irregularly shaped craters (as it were) from 50 to 500 feet in diameter at top, and some of them 150 feet deep. The ice was frequently visible on the sides, and at the bottom was a dirty sea-green-colored pool of water, apparently very deep. The bases of the hills on either side, and frequently far up their faces, are one succession of landslips; but from their distance, I do not believe it possible that the debris in the centre of the snow-bed valley, can have fallen there from the side hills." Lieut. Weller also says of the same glacier in his journal published in the *Journal Asiatic Society*, No. 134:—"The mass of desolation, as described at the source of the Gorce, continues thus far up—that is about 4 miles, and how much farther no one will or can tell me. The fissures hereabouts are narrow, instead of being crater-like, and the ice when visible is more nearly the color of snow. On the opposite (south) side, huge accumulations of ice and gravel are to be seen in the openings between the hills;—once on either side, I had a view of the old ice high upon the hills; its light sea-green color, with strongly defined and fantastical lines of shape (castles, stairs, &c.) formed a very pleasing and grand appearance." This glacier is known to be 6 or 7 miles long; its lower extremity is at 11,600 feet above the sea.

In the published journals of travellers in the Himalaya, that I have seen, I have not met with any other accounts of glaciers sufficiently distinct to be worth quoting, though we not unfrequently come across a snow-bed that seems suspicious. I am however fully satisfied of the *actual existence* of many other glaciers, both from the verbal accounts of Mr. Batten, who has been a resident in Kumaon for many years, of my brother, Mr. H. Strachey, who visited several of the passes into Tibet last year, and of the Bhotias (the natives of the valleys immediately below the snowy ranges), and from having myself had distant views of several.

From these sources I am able to affirm positively, the existence of glaciers at the heads of the following rivers;—viz., the Vishnoogunga (near Budrinath); the Kylgunga, the Koorghurh, the Soondurdoonga,

all rising from the southern side of Tresool and Nnuda Devec ; the Ramgunga (that which falls into the Surjoo, not the great river of the same name) ; the Piltee, an affluent of the Gorec ; and the Gonka which rises near the Oonta-doora or Joohar pass into Tibet.

I therefore conclude, that in the Himalaya, as in the Alps, almost every valley that descends from the ranges covered with perpetual snow, has at its head a true glacier ; and in spite of M. Elie de Beaumont's ingenious fact, that the seasons here " have no considerable variations of temperature," and that " the thaw and frost do not separately penetrate far enough to convert the snow into ice ;" I am of opinion, that the very great intensity of all atmospheric influences, including variations of temperature, should render these mountains one of the most favorable fields for the investigation of glacial phenomena.

APPENDIX.

A short account of the principal Phenomena of Glaciers, abstracted from chapters 2, 8 and 21 of Professor Forbes' Travels through the Alps of Savoy, &c.

Perpetual Snow.—The atmosphere becoming colder as we ascend in it, the tops of mountains that are more than a certain height above the level of the sea, are always covered with snow ;—this height is greatest at the equator, where it is about 16,000 feet, and gradually diminishes towards the poles, where the natural covering of the earth is ice and snow.

Snow Line.—The snow line is an imaginary line passing through those places, at which the snow which falls in one complete revolution of the seasons, is just melted in that time, and no more.

Glaciers.—The common form of a glacier is a mass of ice, that extends from the region of perpetual snow, into the lower valleys, which are clothed with vegetation ; and that sometimes even reaches to the borders of cultivation. The snow line on the glacier, is somewhat lower than on neighboring parts of the mountains ; but below it, the snow is melted and disappears from the surface of the ice, as regularly and entirely, as from that of the country into which the glacier descends.

Motion.—The existence of the glacier in such comparatively warm situations, can only be accounted for by supposing, that its daily waste is supplied by its daily descent, and that its terminal face which appears unmoveable is in fact perpetually changing. Therefore when the total waste exceeds the total motion the glacier appears to recede up the valley; when the converse happens, the end of the glacier advances; when the two are exactly the same it remains in the same position.

Rivers rising from Glaciers.—The waste of the glacier from the action of the sun and rain, gives rise to a stream of turbid water, which issues from the extremity of the ice, out of a cave.

General form of glaciers.—Glaciers vary in their dimensions, up to 3 miles in width and 12 in length. The lower portion is usually very steep; the middle has only a moderate slope; the upper again is more inclined. The sides when exposed are also very steep. The surface is more or less undulating, the irregularities in a great measure arising from the action of the water, that collects from the surface drainage, and forms streams of considerable size.

Crevasses.—The ice is considerably broken up, by fissures or rents, called crevasses; these are usually vertical in their direction, and of widths varying from a few inches to many feet, sometimes extending almost from side to side of the glacier.

Moraines.—The rocks and debris, that fall upon the ice from the cliffs that usually bound the glacier, instead of accumulating where they fall, as they would do if the ice were stationary, are carried *down* as it advances, and form continued lines along the sides of the glacier. Their stony borders are called moraines.

Lateral Moraines.—Those moraines that are formed on the sides of the glacier, as just described, are called lateral moraines.

Medial Moraines.—When two glaciers from different sources meet, the inner moraines of the two unite, and continue to move on together down the compound glacier, which but for this mark would at a short distance below the point of union be undistinguishable from a simple one. Such a moraine, having clear ice on both sides of it is said to be a medial moraine.

Elevation of Moraines.—From the protection given to the ice below by the rocks of the moraine, it appears to rise gradually above the general surface of the glacier, which on the other hand is constantly

being depressed by the action of sun and rain, while the protected parts of the ice remains unmelted. The moraine is not a mound of debris, as it appears at first sight, but an icy ridge, covered with rocks, sometimes with a breadth of some hundreds of feet, and raised from 50 to 80 feet above the general level of the ice.

Glacier Tables.—Single blocks of stone lying on the ice, appear from the same cause to raise themselves above the surrounding surface, upon pedestals of ice;—these are called glacier tables.

Glacier Cones.—An accumulation of sand which sometimes forms in holes in the ice, in like manner protects the surface beneath it, and by a curious inversion of its shape forms a pyramid or glacier cone, sometimes 20 or 30 feet high and 80 or 100 feet in circumference.

Baignoires.—An operation strangely converse of this takes place, when a small cavity forms in the ice, and becomes filled with water, but with no considerable quantity of debris. Water just freezing is *lighter* than water at a temperature somewhat higher; the water at 32° therefore floats on the surface of the other. When therefore the surface of the water in the pool becomes heated by the sun's rays a little above 32°, it immediately sinks, and by communicating its extra heat to the bottom of the cavity, melts and deepens it, and being cooled, is ready to rise again to the surface in its turn.

Structure of ice.—The ice of which a glacier is composed, consists of bands or laminae of blue compact ice, alternating with others of a lighter color, not less perfect but filled with countless air bubbles. This peculiar structure gives to a glacier all its extreme brittleness. The difference of hardness of the strata, causes the surface of the glacier in many parts to appear striated with fine lines, and when groups of harder bands occur, there are projecting ridges with grooves between them, much resembling ruts in a muddy road.

Direction of structural planes.—The direction of the bands or veins is explained in fig. 9, which shows an imaginary section of a glacier. The strata of ice lie like a succession of shells one within the other.

Cause of veined structure.—The origin of the veined structure, seems not be altogether satisfactorily explained; but the *direction of the veins*, and the *form of the structural surfaces*, is well accounted for by Professor Forbes, as the effect of the different velocities of the different parts of the ice, which as in running water is greatest in the centre

and at the surface where the friction is least, and vice versâ. To enter more fully on this matter is beyond my proposed object.

Névé.—That part of the glacier above the line of perpetual snow, is called the *névé*. It is composed of granular snow alternating with bands of ice and has the appearance of being regularly stratified in beds parallel to its surface. The passage of *névé* into true glacier ice, is also a point not satisfactorily explained.



Zur Litteratur und Geschichte des Weda. Drei Abhandlungen von Rudolph Roth, Doctor der Philosophie. Stuttgart, 1846. (On the Literature and History of the Veda. Three Treatises, by Rudolph Roth, Ph. Dr., Stuttgart, 1846.)

(Translated by J. MUIR. Esq. C. S.)

This little book, containing as it evidently does the results of profound and accurate research, is a valuable addition to our knowledge of the structure and contents of the several Vedas, and of the interpretative literature to which these ancient books gave rise. Some account of the brochure will, it appears to me, be acceptable to the Society, at the time when it has just undertaken the publication of the whole text of the Vedic hymns. Dr. Roth's book consists of three treatises; the first entitled "The Hymn Collections," extends, with excursions and remarks, from pp. 1 to 52. The second is headed "The oldest Vedic Grammar, or the *Prâtisákhyas Sûtras*, pp. 53—86. The third (pp. 87—144) bears the title "Historical matter in the *Rig Veda*; *Vasishthâ's* contest with *Viswamitra*." The contents of the first treatise will be fully learnt from the following translation of it entire, with one of the notes, which I hope may be considered admissible into the pages of the Society's Journal. The second treatise enters into detail in regard to the *Prâtisákhyas Sûtras*, of which some account has previously been given in the first. The third quotes and translates some hymns from the *Rig Veda*, which contain traces of a conflict between the rival priestly houses of *Vasishtha* and *Viswamitra*, and record the names and wars of a number of petty tribes who at that early period occupied the Punjab. The whole of Dr. Roth's book,

which extends to 144 pp. only, is well worth translating, and I trust this may be undertaken under the Society's auspices. It should prove interesting not only to the general student of Indian antiquity, but still more so to that enquiring class of Hindu youth, who, with as yet but imperfect appliances, and under incompetent guides, have been directing their attention, though but uncritically, to the earlier doctrines of their religion.

Dr. Roth appears to have spent some time at Paris, London and Oxford in the examination and study of the MSS. connected with his researches. The short treatises under review are only, it is to be hoped, the first fruits of his studies. In his dedication to Professor Wilson, and in his first treatise, he alludes to his intention to publish the Nirukta. He appears to have a further work in view, but speaks doubtfully of the prospects of its completion, in these words: "The labour, however, which I propose to myself as the compensating fruit of these exertions, an Archæology and Mythology of the Veda, is, for the present, rather a wish than a possibility."

Dr. Roth himself however is not the only new labourer whom we have to welcome to this field of exertion. In a note at p. 22, he mentions his friend Dr. C. Ricu of Geneva, as having under preparation an edition of the *Āitareya Brāhmaṇa*. In p. 25 he mentions Dr. Trithen in London as engaged in the same studies. At page 4 allusion is made to an edition of the *Sanhitā* of the *Sāmaveda*, promised by Dr. Theodore Benfey, who has already published an article on India in Ersch and Gruber's German *Cyclopædia*, which is referred to with indications of approbation by M. Burnouf, in his introduction à l'histoire du *Buddhisme Indian*, *passim*. Allusion is made by Dr. Roth at the close of his first lecture to the edition of the *Rigveda* which Professor Wilson has in preparation. It does not appear, however, when this important work is to be looked for.

I.—THE HYMN COLLECTIONS.

Delivered at the meeting of Orientalists at Darmstadt, at the sitting of 2d October, 1845.

You have permitted me, Gentlemen, to speak on a branch of Indian literature which, if any can, asserts a claim to general interest, and the cultivation of which demands the union of various powers, but

which will at the same time yield the richest spoils,—the literature of the Veda. You will allow me, in order to make room in some measure for this extensive subject, to regard as known all which has hitherto been written or published on the Veda. Of this there is so little, and that little has been so much the subject of remark, that it is sufficiently known in all Oriental circles.

It has been the peculiar fate of the Veda that being at first veiled or magnified into the extravagant by Bráhmancial mystification and ostentation,—the effects of which have not yet disappeared,—it presented a terrifying complication of writings, with which no one trusted himself to meddle. When H. T. Colebrooke had at length brought light into the darkness, still the importance of these books in part escaped him; and Frederick Rosen, who formed a right estimate of it, and was the man to render the discovery fruitful, was only permitted to rear himself a beautiful monument, to make a commencement, which makes us the more severely miss the continuation, in proportion to the certainty that the latter would, through the writer's growing experience, have gained a perfect form. No other was willing to tread in his footsteps; and so Rosen's book, and Colebrooke's, in its way, excellent treatise, are still the only mines for our knowledge of the Veda. I can scarcely mention what has been done by the Missionary Stevenson for the Sáma Veda: for his edition of the text is less correct than any tolerable MS., and his translation is utterly useless.

Let me be permitted here to supply to Colebrooke's treatise those complements, which I have had the opportunity of drawing from an inspection of the MS. sources in Paris, London, and Oxford,—complements which will refer to the relation of the first Veda to the remaining collections of hymns, and to its Indian compilation, and which, —so far as our researches must be based upon indigenous preparatory labours also,—could be communicated in no more fitting quarter than in a learned circle which has set itself for its task the investigation of the East. For according to my conviction no more essential service could be rendered to the history of the ancient east, perhaps to the whole of ancient history, than to make known and exactly investigate the Vedic writings.

The well-known definition of the difference between Mantra and Bráhmāna,—which is found in all possible writings explanatory of the

Veda, and is amply handled in the *Mimáṃsa*, and according to which the *Mantra* is commonly metrical and an invocation, while the *Bráhmaṇa* is mostly prose, and consists of practical religious precepts,—this definition denotes also the fundamental division of the Vedic books. They sever themselves into collections of hymns, and liturgical works. That the former, not only in their origin but also in their collection, are more ancient than the latter, so long as no proofs appear to the contrary (and I have been able to find none) we may, I believe, regard as settled.

But among the five Vedic books which are called *Sanhitá*, there are only four hymn-collections. The fifth, the *Taittiriya Sanhitá*, which is regarded as a principal part of the *Yajur Veda*, is a liturgical book, which may occupy the same place in respect of this Veda, as the *Aitareya Bráhmaṇa* fills for the *Rig Veda*. (It is also called *Taittiréya Bráhmaṇa*). •

Among these four collections of hymns that of the *Rik* has the most considerable compass; and may amount in all to near eleven thousand verses. The *Atharva* hymns are nearly as numerous. The *Vájasaneyá Sanhitá* (of the *Yajur Veda*) may amount to half the extent of the *Atharva*, and the *Sáma Sanhitá* to half the *Vájasaneyá*. Hence would result for the four collections united the number of about 30,000 distichs.

Colebrooke has remarked here and there in his treatises that whole hymns, strophes, or single verses of one Veda are again found in another, or in all the rest, without however giving any more exact determination of the matter. But it appears to me important to be able to estimate the total extent of the old poems which have come down to us in the Vedas, and their distribution in the single collections, for from this point the first step must be taken towards a determination of the reciprocal relation of the different Vedas. The information I can supply on this point is as follows :—

The *Sanhitá* of the *Sáma Veda* is, according to the testimony of the Indian commentators, (e. g. of *Sáyana*, in the introduction to his explanation of the *Rik*,) completely contained in the first Veda (the *Rik*), i. e. the single verses of the *Sáma*, are repeated in the connexion of the hymns of the *Rik*. Some very rare exceptions of verses, however, occur, which the *Rik* does not contain. The references to particulars

will be fully given in Dr. T. H. Benfey's edition of this *Sanhitá*, for which we are now looking.

The *Vájasaneya Sanhitá* of the *Yajush*, on the contrary, embraces a number of sections which are peculiar to it. From an inspection of several parts of this book, for which however I had but slender assistance from commentaries or similar works, it appears to me that perhaps the half of the whole recurs in the *Rik*. The other half consists in great part of sacrificial formulas, e. g. the *Swáhá* repeated hundreds of times, and perhaps only a fourth of the whole consists of fragments of songs or invocations in prose, peculiar to this collection.

It is more difficult for me to give similar specifications in regard to the *Atharva*, for as we generally see it treated in a step-mother-like fashion so has it also found no commentator, and the only assistance which I have been able to obtain is a carelessly-made copy of the *Anukramaní* of this *Veda*, which pays much more attention to the metres of the single verses, than to other points of information. Excepting the names of gods, I find only *Atharva*, and *Bhrigu Angiras* named as *Rishis*, or composers of hymns, though not only strophes but whole hymns of from 30 to 40 verses, which in the *Rik* have their author specified, are received into the *Atharva*. It is however easy to perceive that this *Veda* contains far more pieces peculiar to itself, than the *Vájasaneyi*, and that what is common to it, with the *Rik Sanhitá* is limited to perhaps a third part of its extent.

The important question which must connect itself with this determination of the external relation of the four collections of hymns, is this: has each of the *Sanhitás* an independent origin of its own? are they in part borrowed from each other? or finally, is one of them,—and it could be no other than the *Rik*,—to be regarded as the source of the rest? A sufficient answer to these questions will of course be only *then* possible, when we shall have in detail before us not only the contents of each *Veda*, but also the variations in the several texts, which in many cases, are very material. A general representation may however even now be derived from the difference in the arrangement which is followed in these collections, and I may therefore be permitted to enter further into this point.

In reference to the use of the *Rig Veda*, we must not allow ourselves to be deceived by the arrangement of the MSS. as they now lie before

us without exception. The division which they present is notoriously a mere external, uniform separation into eight parts (*Ashtaka*), next of these into eight sub-divisions (*Adhyāya*, lectures,) and lastly into sections (*Varga*) of five verses each. We might from this believe that we had before us an unarranged aggregate of songs, distributed in this manner only on account of an external point of coherence. But along with this division there exists an entirely different one, as we now know it principally from Śāyanā's commentary. This arrangement has for its largest section the *Mandala*, (circle, book,) within that the *Anuvāka*, (chapter,) with a number of hymns, (*sūkta*), which again are parted into their distichs (*rich*.)

This division into ten *Mandalas* is beyond all doubt the original one, fixed by the collector of these hymns as it has come down to us. Hymns which were ascribed by tradition to the same author or the same family, or hymns which belong to the like sacrificial ceremony, as the *Soma*-hymns of the 9th *Mandala*, are here united in one section, without regard to their outward extent.

The first mentioned division (into *Ashtakas*) on the contrary appears to have its ground in the need of sections of uniform size for the use of the *Veda* in the schools. In the 15th section of the *Prātisākhya Sūtras* ascribed to Saunaka, there is found a collection of rules for the reading of the *Veda* in teaching, which appear to have reference to this point. The teacher recited two or three distichs, according to the length or shortness of the aggregates of verses (hymns), which were repeated by the scholars in order. One such portion is called *prasna* (question,) and sixty or more of these, says the *Sūtra*, i. e. about one hundred and fifty verses, compose an *Adhyāya*, a lesson of the *Veda*, which is at the same time the quantity actually read in the school.

Besides that it would be absurd, where a real division of the matter exists, to regard one which is merely formal as the original one, we have the proof for the greater antiquity of the *Mandala*-division in the modes of speech employed by the oldest interpreter of the *Veda*. The *Nirukta* names the *Rig Veda* in several places, and always with the designation *Dasatāyya*, the ten parts. The same mode of designation is found in the *Prātisākhya Sūtras*, which are older than the *Nirukta*, in the commentary on the latter, and in a number of other books. The *Anukramanikā* of the *Rik* also has this division, although in the

MSS. it is externally separated into Ashtakas. Hence it results that it would be unnatural to make any other division than that into ten Mandalas the basis of a future edition of this Sanhitá.* For in whatever way criticism may decide in detail on the historical value of the tradition touching the authors of the Vedic hymns, still this tradition has been held authoritative by the collector and by the oldest interpreters of the Veda, and it may moreover be proved from the affinity of the representations and of the language that, in the present recension of the Veda, those sets of hymns are mostly arranged together, which must have had a common origin, and possibly may have been previously united in particular collections.

In the Mandala itself again there exists an arrangement. It may in most cases be shown why the hymns are given in this determined sequence. That a regard to their ritual import had its effect, is evident, but it was allied with the main principle of each division, viz. to place together what was homogeneous. Hymns addressed to Agni follow each other, and generally occupy the first place in the several books, then the hymns to Indra, and so on. This however is not carried so far, as that we can assume the collection to have been made for liturgical ends. The Rig Veda even contains hymns and parts of hymns, which the commentator, though very scrupulous in this matter, cannot assign to any religious observance. I rather believe than one can with full reason call the Rik the historical Veda. And its collection is a wonderful work, which attests the scientific perception of this people in an age which,—as I shall be able to show further on, reaches far above the age of the collection of the Homeric songs. There are united here more than a thousand of those sacred songs, with which the forefathers dwelling on the banks of the five streams supplicated prosperity for themselves and their flocks, greeted the rising dawn, sang the fight of the lightning-wielding god with the gloomy power, and celebrated the help of the celestials who had delivered them in their battles. And these songs are collected, not, perhaps, because the religious worship had occasion for them in this manner, but the whole treasure of this ancient poetry was to be here preserved unen-

* Rosen has indeed, on external considerations, published the first Ashtaka; the entire first Mandala would have been too extensive for him, for it contains 190 hymns, and reaches nearly to the end of the second Ashtaka.

tailed and well arranged. We should moreover deceive ourselves were we to believe that the Veda contains exclusively religious songs; a number of pieces have found their way into it, which have no reference to the worship of the gods.

In the tenth Mandala, e. g. in which a dice-player laments deeply his ruinous propensity, which against his best resolutions, seduces him again continually into new sin. Another piece in the seventh Mandala, ascribed to Vasishtha (of which Colebrooke has already given a passing notice) describes in a sportive way the revival of the frogs at the beginning of the rainy season, and compares their quacking with the singing of Brahmā at a sacrifice. A very frequent form of hymn (of which examples are wanting in the part of the Rik already made public) is the dialogistic,—conversations of the gods among themselves, or of a god with a Rishi. In the fourth Mandala, e. g. Vāmadeva speaks with Indra, and mocks him, “What can Indra forbid me? no one regards him either of the living, or of those who shall be born.” As to these and similar pieces the interpreters are at a loss how to assign the Rishi and the Devatā, (i. e. the inspired author and the god invoked;) but in the song of the gamester (abovementioned) they have preferred making the dice the deity (devata) rather than give up these unbending terms. But the less these remnants of ancient poetry are suited to the established frames of liturgical forms, the more worthy they undoubtedly are of our observation; and a representation of the most ancient circumstances of the people, and the character of this literature may in many respects be more easily acquired from these hymns, than from those constructed in more regular form. Yet I will not assert that these pieces belong to the oldest of all; on the contrary, the most of them bear plain traces of a later origin.

The Sanhitā of the Rig Veda thus claims to give the hymns complete, just as the Rishi has spoken,—or according to the expression of the interpreter,—has *seen* them. Not so the collections of the Sāma, and the Vājasaneyā Yajush. Both give single verses or single strophes, which do not at all necessarily stand in any internal connexion with each other, but only receive such connexion through the ritual which they accompany. In the Sāma I believe I have remarked besides, that not only the metre, which in virtue of its connexion with melody began very early to play an important part in sacrificial rites, but even

the accidental occurrence of the same or like-sounding words has frequently had an influence on the sequence of single verses. That the first principle of arrangement in both these Vedas is a liturgical one, needs no confirmation, and the most important thing which can be performed for either consists in the indication of this more or less loose connexion of the text with the ceremonial. An explanation of this principle, however, such as we demand, must necessarily go back to the connexion of the passages, i. e. to the Rik. Thus both (the Sâma and the Yajush) properly call for illustration in those points only where they depart from the first Veda.

For even were we to take up again the enquiry abovementioned into the relation between these three collections in respect of their origin,—for even were we to assume that the Sâma and Yajush, or one of them, had been compiled earlier than the Rik Sanhitâ, still we shall not be able to deny that the hymns contained in the latter (the Rik) are the same from which those pieces (i. e. those contained in the Sâma and Yajush) were taken; we shall not be able to invert the relation so far as to hold the hymns of the Rik for mere deckings-out, amplifications of the ritual fragments. For the latter, as we find them in both of those collections, have no independent significance, they are taken away from a connexion, and in the former the shell would be of more importance than the kernel.

The assumption of a priority in the collection of the liturgical Vedas would however have in it nothing at all improbable. It is rather the natural course that the immediate want is first satisfied, before one arrives at the derivative one. These fragments were collected, as they were in use in religious worship,—remnants of complete songs, which had acquired importance for religious services before other portions of those hymns,—these, (I say) were collected because they were wanted for the regulation of the ritual, which in the sequel was to grow up into so huge a system. It was only in the second place that the collection of the complete hymns on which the ritual was based, was arrived at; and since those parts of hymns which the Sâma and Yajush contain were already guarded from alterations by writing and by their liturgical importance; whilst the undivided song existing as yet perhaps only in recollection, or scattered here and there, and as not immediately pertaining to sacred offices, was also less scrupulously

preserved,—it would be easily explicable if both those Sanhitás contained variations of the text, which as regards the passages concerned are older than the text of the Rik. We may even go further and grant that as the compilation of the Rik already in a certain sense rests upon a scientific want, so science also after the manner of ancient and modern times wished to do too much, that men had allowed themselves improvements and sought to restore uniformity, and that thus we had before us in the Rik a conscious retouching. Certain traces testify at least to external fusions; and although I cannot believe that the compiler of the Rik would have allowed himself to make essential and extensive alterations, yet I could not venture to pronounce against the assumption of a retouching, before we have before us the bulk of the textual variations of the Sáma, at least, which are far more important than those of the Vajasaneyé (Yajush). The above mentioned edition of that Veda will give the amplest information on this point.

As regards the Atharva, the question above proposed appears to be more easily decided. This collection contains, not single unconnected verses, but complete hymns, and has a real arrangement, (i. e. one depending on things, not merely formal.) In this respect it is like the Rik, and can really be called a complement of the first Veda, a complement meant to embrace the hymnologic productions of its time, when the mantra was already no longer an expression of immediate religious feeling, but had become a formula of incantation. This Veda therefore contains especially sentences intended to guard against destructive operations of the divine powers, against sickness and noxious animals, imprecations on enemies, invocations of healing herbs, and for all manner of occurrences in ordinary life, for protection in travelling, luck in play, and such like things. In the pieces which are common to it (the Atharva) with the Rik, it allows itself a great number of transpositions and alterations, which besides in most cases appear to be arbitrary. The language in those sections which are peculiar to it, approaches the flowing expression of later times, but has withal the grammatical forms of the older songs. Between it and the Rik there exists, further the peculiar relation, that the latter also towards the conclusion (in the last Anuváka of the tenth Mandala) contains a considerable number of sections which bear completely the character of the Atharva-hymns, and are also actually found repeated in this Veda.

Besides these general tokens of a later origin of this Veda, we find yet further a number of particular marks among which I here adduce one. The hymns of the Rik variously celebrate the deliverances, which Indra, the Aswins, and other gods had vouchsafed to the forefathers. All the names of the persons so delivered, however, lie beyond the time of the author himself, and one seldom meets with the name of a Vedic Rishi. But in the fourth book of the Atharva there is found e. g. a hymn which invokes Mitra and Varuna to preserve the suppliant, as they had preserved—not Dadhyach, Rebha, Pedu, and others, but Jamadagni, Vasishtha, Medhātithi, Purumilha, &c., all names of men whom tradition makes to be authors of the hymns of the Rig-Veda.

It thus appears, from all that has been said, to admit of no doubt that the Atharva has not only been later collected than the Rik, but has also a later origin, and in both together we have before us the mass of the hymns of two periods. To understand these in their whole compass, must clearly be the first thing which we can do in this province; and a recension of both these Vedas should therefore precede the investigation of the liturgical system, from which only, again, the Sāma and Vájasaneyé can receive light. It is impossible to master perfectly the practical religious writings, the Bráhmanas, and what is connected with them without a knowledge of the text of the hymns, round which the whole ritual ranges itself; while, on the other hand, we cannot hope to be essentially advanced in the historical understanding of the ancient poems by means of a literature which has for that text only a stiffened sense, determined by the ritual. What we shall take from this literature is the explanation of single liturgical representations which are found already in the hymns. The whole system of worship is however in itself a very important object of investigation, and well worth the labour which its explanation will cost. The number of writings pertaining to this subject is extraordinary. All the Bráhmanas, a great number of Upanishads, and the numerous Srauta and Grihya Sūtras lie within the circle of these investigations.

In order now to give an account of how the Veda has come down to us, and of what has been done for the Rig Veda in particular by indigenous grammar and interpretation, I must speak of a class of writings, which to my knowledge have not yet formed the subject of discourse

in Indian literature, but which deserve in a high degree to be introduced into view,—the *Prātisākhyā Sūtras*.

I have found out three writings under this title. That of greatest extent and importance is ascribed to Saunaka, and consists of eighteen *patalas*. A second book bears the name of *Katyāyana* (the same without doubt who is named as the author of the *Anukramanī* to the *Rik* and to the *Vājasaneyī Sanhitā*), and numbers eight *adhyāyas*. Finally, a third *Prātisākhyā* is as yet without a (discoverable) author. The beginning of the text, as well as the commentary, which without doubt would have given some notice of the author, or the school, is wanting in the only MS. of this work which I have found at Oxford. I have but lately learnt that there are several writings of this name in the Berlin collection, and have as yet been able to procure no information respecting them. I conclude however from the statement of the extent of the Berlin MS. that none of them can be the *Prātisākhyā* ascribed to Saunaka, the most important among the three. If the remark made on two Nos., viz. that they consist of three chapters, be correct, we shall find here yet a fourth *Prātisākhyā*.

I must thus in my account confine myself to what I have been able to learn from the explanatory works as yet at my command, which, for the second and third of these books, are very imperfect. These writings contain rules on the elementary part of general, but particularly Vedic Grammar, on the accent, on Sandhi, on the permutation of sounds, (e. g. the *nati*, change of dentals into cerebrals,) on the lengthening of the vowels in the Veda, (*pluti*) on pronunciation, on the various *pāthas* of the Veda, &c. The first *Prātisākhyā* contains besides a section on metre, which is far more valuable for the Veda, than the utterly unimportant book *Chhandas*, included in the *Vedāṅga*.

That the common denomination of these writings, *Prātisākhyā-Sūtrāṇi*, cannot be the original one, results from the signification of the word; “grammatical aphorisms, current in single *Sākhās* or schools.” In a commentary on *Gobhilās Srauta-Sūtras*, one of them is designated as *Mādhyandina-Sākhyā Prātisākhyā*, i. e. as a collection of those aphorisms which the well known Vedic school of *Mādhyandina* followed. But I conclude from a passage in the first book of the *Nirukta*, as well as from the introduction and the subscriptions to the chapters of the first *Prātisākhyā*, that these books were at an earlier period

called Pārshada, i. e. "what is received from, or belongs to, the assembly," and to this appellation would be joined the particular designation of the school, thus Mādhyandina-pārshada, &c. The same passage of the Nirukta also shows that these books are older than Yáska, and that they were known by him as manuals of the different schools of grammarians (Karaṇa.) In order to arrive at an approximative determination of time, let us now assume,—according to the current and tolerably well established view,—the year 350 B. C. as the date of Pāṇini, let us further set Yáska only 50 years earlier, and we then have the end of the 5th century B. C. as the age of the latter. Since now Yáska is acquainted with the Prātisākhya, these must have been already composed and recognized as an authority in the 5th century B. C. These books, themselves, again, recognize a great number of still older grammarians (in all about thirty names) and even schools. These must therefore be assigned to the beginning of the 5th or end of the 6th century B. C.

In order to extend my demonstrations from this point, I must mention the various modes of writing the Vedas, the Pāthas. Of these, according to the representation of the Prātisākhya, there are three, the Sanhitā-pātha, the Pada-pātha, and the Krama-pātha. Sanhitā-pātha means the natural mode of writing, with observation of the rules of Sandhi. The Pada-pātha which separates single words, and comparatively speaking parts of words (elements of a compound word,) is sufficiently known by means of Rosen's edition. The Krama-pātha, of which we have as yet no printed specimen, is twofold, the *letter* krama, and the *word* krama (varṇa-krama, and pada-krama); the former always doubles the first consonant of a group of consonants (most MSS. of the Vājasaneyi are written in this way): the *word* krama takes two words of the sentence together, and always repeats the second of them with a following one. In this Pātha itself again a number of changes may take place, which I here pass over.

We know further the inventors of these modes of writing. Sākalya is named by Yáska as the author of the Pada-pātha, (at least for the Rig Veda) and other accounts which we have of him in the Prātisākhya and even in Pāṇini, do not contradict this statement. This grammarian and his school appear to have had a great influence generally on the conformation of the Veda, at least of the Rik. The orthography of

the MSS., as it has come down to us, and as it is fixed in the *Prātisākhya*, even to the minutest particulars, is principally that of that teacher, and the *Anukramani* of the *Rik* ascribed to *Kātyāyana*, calls the *Sanhitā*, of which it is the index, i. e. the *Rik Sanhitā* such as we now have it, *Sākalaka Rik Vedāmnāya*, i. e. the redaction of the *Rig Veda* which has come down to us from *Sākalya's* school. Further researches may without doubt add more materials on this subject, and place yet more fully in the light the remarkable circumstance of the various redactions of the *Veda* in remote antiquity. Only we must, in this matter, beware of giving too much credence to the statements of the *Purāṇas*, which give us accounts of all possible *Sākhās* (schools or divisions) of this and that *Veda*. The numerous citations in older writings, even in the books which pertain to the liturgy of the *Veda*, will instruct us far more surely on these points.

In regard to the third mode of writing the *Veda*, the *Krama-pātha*, we know at least by a statement in the first *Prātisākhya*, that the word *krama*, in its simplest form, derives its origin from *Panchāla*, the son of *Babhrū*, (whom I have found named in no other place.)

It is easily seen that these different ways of writing the *Veda*, can have no other foundation than the securest possible preservation of the text, in a certain degree they also already aim at its explanation. The last named *krama* is nothing else than the introduction of the *pada-pātha* into the *Sanhitā-pātha* itself; each word appears first in its *pada*-form, and then in its connexion with the whole sentence.

But it will now be conceded that measures, thus carefully sought out, for the fixation of a text could not have been hit upon by its author, or even by a compiler, but must belong to a period for which this text was already something completely fixed, to which it was an object of study, and indeed the most careful, yea, minute study, and had even become a subject of controversy in the schools, (all of which can be established from the *Prātisākhya*,)—in a word, to a period which was no longer certain of the sense of the *Veda*, and had to guard it, at least externally, by exact regulation of reading and writing, against the alterations of misunderstanding.

Supposing that we have found above that the teachers who are named in the *Prātisākhya* as compilers of the *Veda*, *Sākalya* and others, must at least fall at the beginning of the 5th or the close of the 6th

century before our era, then we may conclude from the nature of that which they have done for the Veda, that several generations must have elapsed between the collection of those texts and them, and that consequently this collection cannot fall later than the 7th century. By what probable interval, again, the origin of these songs may have been separated from their collection, is a question which we shall never be able to answer with certainty, but to the solution of which we may approach tolerably near by means of the share which the compiler has had in producing the present form of the Veda, while this share itself will be on the one hand disclosed to us by the internal marks of the text itself, and on the other by a comparison of the *Sāma* and the *Vájasaneyi*.

How closely all these questions touching the Veda are connected with the history of the Grammar so remarkable for its high antiquity, appears from what has been said above. The Veda was the first object on which it exercised itself; and thus there lie in it united in their germ those sciences which at a later period diverged from each other, viz. the explanation of the Veda, and general grammar, of which for us the oldest representatives (who stand equally high in Indian literature) are *Yáska* and *Pānini*.

To the former the *Naighantuka*, and *Nirukta*, the sources of all later exegesis are ascribed. That both these are immediately connected admits of no doubt, but I believe that the *Naighantuka* is older than the *Nirukta*: the proofs of which I must reserve for another place. Thus *Yáska*, if the *Nirukta* belongs to him, could not be also the author of the *Naighantuka*. The last named little writing is in its first part a Vedic vocabulary, in the second, a collection of the more difficult or unusual words, taken from the text of the Veda, and ranged together without any alteration or explanation. The third part is a collection of the whole of the names of the gods according to their three domains (*sthána*) earth, air and heaven. The *Nirukta* itself is nothing else than an explanation of the *Naighantuka* (hence, too, its name) to the citations of which it adds the passages of the texts, and comments on them.

People have been hitherto inclined to attribute a very high antiquity to the *Nirukta*. That it belongs to the oldest part of Indian literature that we possess excepting the Vedic writings, is not to be doubted; it

shows however, by its contents that it belongs to an already far advanced period of grammar and interpretation. That however it is older than Pāṇini, we may conclude from the less developed state, particularly of the technical part of grammatical science in the Nirukta. For along with a certain richness of grammatical expressions, it still wants the greater part of those peculiar technical terms, of which it is not credible that they were wholly Pāṇini's own creation. Yāska is entirely ignorant of algebraical symbols such as Pāṇini has. That the latter makes no mention of Yāska, though he had in many places an opportunity of doing so, can no longer strike us now that we know so large a number of decidedly older grammarians of whom he makes no mention; and would at most show that in Pāṇini's time this book did not yet enjoy that general circulation and esteem, to which it latterly attained. The introduction to the Nirukta, very remarkable in many respects, which contains the sketch of a grammatical and exegetical system, makes us acquainted with the views of Yāska and his predecessors, and it is in this way possible for us to institute a complete comparison between these older grammarians and Pāṇini. For this I believe I may be permitted to refer to the edition and explanation of the Nirukta, which I think of sending to the press without delay. Let me only be allowed to examine somewhat more closely one section of that introduction, which is calculated to throw light on the age of the Veda, and of its interpretation.

Yāska mentions the opinion of the Grammarian Kautsa that the songs of the Veda are inaccessible to grammatical and logical interpretations; for their sense, says Kautsa, is fixed by the Brāhmanas and by the use of the hymns in the ritual, and thus forbid a free explanation. The hymns, says he further, even contain what is absurd and impossible; they contradict themselves, when e. g. they say "There is but one Rudra and no second;" and again "numberless are the thousands of Rudras on the earth;" finally they contain, Kautsa thinks, passages completely unintelligible. To the last reproach Yāska replies, it is not the fault of the beam, if the blind man does not see it, but of the man; and tries to refute or explain the rest in detail. That the sense of the hymns is determined by their ritual signification, as the latter is taught in the Brāhmanas is (he thinks) by no means a fault, since these books give the correct meaning. Yāska (as is further clear from a number

of other passages of the Nirukta) and before him Kautsa, had thus already before them the whole system of the ritual, and the exactly regulated application of the Vedic texts in religious services; they were acquainted with a number of the fundamental works of the Kalpa, of the Bráhmaṇas; and the rationalistic Kautsa could count the Veda senseless and the Bráhmaṇas as false representations. A conclusion may hence be drawn as to the length of time* which must lie between this grammarian and the Bráhmaṇas; and as to what further period again must intervene between these liturgical writings and the Veda, which they explain allegorically and mystically, and recognize as already collected and arranged in the way in which it has come down to us; of which, e. g. the Aitareya Bráhmaṇa gives the most numerous proofs.†

By means of Buddhism we have, from quite a different side, a proof, which chimes in with the above, for the antiquity of the scientific treatment of the Veda, and the extended development of the ritual; and I mention this only to show how that which we discover through the serial sequence of the Vedic writings, is confirmed through what is as yet the most certain historical channel. Sákyaṃuni comes as the proclaimer of a new religious truth, by which the limits of the way of salvation, the mass of the bráhmaṇical institutions are torn down. His doctrine is a refuge even for Bráhmaṇas, who were unable to encounter the difficulties of their own complicated system.‡ If Buddhism could have such an importance in the 6th or 5th century B. C., then must that entire edifice of worship and ceremonies, which is based on the practical part of the Veda, the Bráhmaṇas, have been long before erected.

* This appears to be the place to which Note 6, which has been translated below refers. The figure of reference, however is not in the text.

† Let me be allowed to remark here by the way on the Aitareya Bráhmaṇa, that this book, which is the highest degree remarkable not only for its liturgical contents, but also, for a mass of historical notices and legends, and on which we have a most excellent commentary of Sáyana, is being prepared for publication by my friend Dr. C. Rieu. It is certainly one of the oldest writings of this kind, and its explanation will form the basis of our knowledge of the ritual.

‡ E. Burnouf, *Introduction à l'histoire du Bouddhisme*, p. 196. Il est avéré pour nous, que la doctrine du Cakja était devenue probablement assez vite une sorte de dévotion aisée, qui recrutait parmi ceux, qu'effrayaient les difficultés de la science bráhmaṇique. En même temps que le Bouddhisme attirait à lui les Bráhmaṇs ignorants, il accueillait avec un empressement égal les pauvres des toutes conditions, etc.

These books themselves are the oldest commentaries of the Veda, and bear witness to the existence of a grammatical science, which therefore must have preceded Buddhism also.

Near and immediately after the Bráhmaṇas, there may, yet further, have existed a proper and independent interpretation of the Veda, but this has been without doubt confined to the more difficult and important passages; and the Naighantuka may have been a collection of such sections, as used especially to be explained in the schools. Continuous commentaries probably did not then exist; and that of Mádhava and Sáyana, composed in the middle of the 14th century of our era is indeed the first and only complete gloss of the Rig Veda. From the long series of centuries which lie between Yáska and Sáyana but few remnants of an interpretative literature connected with the first Veda have remained to us, or at least have as yet been discovered. Sánkara and the Vedantie school had turned chiefly to the Upanishads. Nevertheless a scholar of Sankara, Anandatirtha, has composed a gloss on one part of the Rig Veda, at least an explanation of which by Jayatirtha, embracing the 2nd and 3rd Adhyáyas of the 1st Ashtaka is to be found in the library of the East India House in London. The mode of explanation is essentially the same as we have in Sáyana, only we can frequently reproach it with a still more violent treatment of the text. Sáyana himself, who is not always scrupulous in stating his sources, besides the Niruktatiká of Durgá, a fundamental book which has been preserved to us, cites also Bhattabkáshara Misra, and Bharataswámi as interpreters of the Veda. Of the former I have seen at least a commentary on a section of the Yájur Veda, on which he appears to have given a complete comment. Sáyana's citations do not by any means necessarily show that he has given any explanation of the Rik.

Finally, Sáyana's commentary itself, which is already in some measure known by Rosen's extracts will always remain our principal source for the interpretation of the Veda, as well as a mine for the history of the literature generally. It belongs, it is true, to a period in which Vedic studies were but artificially revived, and to the range of whose view that ancient literature lay so far off that we cannot conceive it to have been distinctly understood;—it is entirely dependent on what is more ancient, and especially makes the most extensive use of the Nirukta and Naighantuka, but still it gives without doubt all which the indige-

nous literature of its time could furnish. As its completeness has had for us the unfortunate consequence of throwing into oblivion older writings of a similar purport, so have we also in it the most essential results of this earlier literature, and we could certainly desire nothing more important for the furtherance of Vedic studies than a complete knowledge of the *Sanhitá* of the *Rig Veda* and its copious commentator.

It affords me peculiar pleasure to be able to conclude with the announcement that such a work is being prepared in England. For it science will be indebted to Professor Wilson, the man whose industry has already opened the way in so many provinces of this literature, and who is daily rendering to these studies, the most essential services by the unsurpassable liberality with which he first has afforded access to the richest Indian library. Under his guidance it will become possible for younger powers, among whom, along with Dr. Trithen in London and Dr. Rieu of Geneva, I may reckon myself, to make accessible to study these extensive materials for the explanation of the *Veda*.

EXCURSES AND ANNOTATIONS.

1. *The Mandalas*.—In the introduction to the *Anukramaniká* of the *Rigvéda*, chap. 2, it is written: *atha rishaya: satarchina ádyé maṇḍalé, antyé ksudrasúktá, madhyaméshu mádhyamá: (MS. 132, E. I. H.)* that is, the authors of the hymns of the first *Maṇḍala* are called authors of a hundred verses, those of the last, poets of the great and little hymn, and the authors of the intermediate *Mandalas*, the mediate. This explains *Shadgurusishya* (No. 1823, E. I. H.) the commentator of this book, as follows: *Ádyaṁaṇḍalasthá rishaya: satarchina iti sanjnitá: (risá shatán chatarehan)*. To which the following verse belongs:

*dadarsádaṁ Madhuchandá dwy-adhikan yad richán satan,
tat-sáhaacharyád anyé 'pi vijnéyás tu satarchina.*

"Because *Madhuchandas* at the commencement (of the *Rigvéda*) has composed 102 verses, (hymns 1—10) the others also who are placed along with him (in this *Maṇḍala*) are called authors of a hundred verses." The name, however, appears to be owing to the circumstance, that the greater number of the *Rishis*, enumerated in the first book, are authors of about a hundred double-verses, for instance *Suna: Képha* of 97, *Kanwa* of 96, *Praskanwa* of 82, *Paruchépa* of 100 double-verses.

The name of the *Rishis* of the last or 10th *Maṇḍala* is thus explained:

násadásit-púrwan mahásúktan, paran kshudra-súktan, (tat.) súktadarsitwád antyé dasamé maṇḍalé sthitá rishaya : kshudrasúktamahásúktá-námána : that is "What is antecedent to násad ásit, is called the great hymn (the collection of great hymns) what succeeds it, the little hymn." The hymn, as here alluded to, commences at the 11th Anuváka of the 10th book. The hymns of the 10 first chapters are also called the great undoubtedly, but in distinction from the 63 very short hymns of the 11th and 12th chapters, which hymns moreover bear a peculiar character.

The Rishis are all enumerated in the Grihyasútras of Aswaláyana, book 3, ch. 4, (MS. 129, E. I. H.) on the occasion of the special kind of honour due to them in connexion with the perusal, as prescribed, of the sacred books (Swadhyáya). I quote here the whole passage; for although it probably does not originally belong to these Sútras, yet it is important for our knowledge of the extent of the Védic literature, and also of that which is held of the same authority, and it shows in a striking manner, how many works of this period are entirely unknown to us!—"Atha rishaya : satarchino, mādhyamá Gṛitsamado, Viśwámित्रो, Vámadévo trir, Bharadvájo, Vasishtha : Pragáthá pávamánya : Ksudrasúktá Mahásúktá iti, Práchinávití Sunantu-Jáminivaisampáyana, Paila-sútra-bhášhya, bhárata-mahábhárata-dharmá-cháryá Jánanti-Bárhavi, Gárjya-Gautama-Sákalya, Bábhṛavya, Mándavya,—Mándúkeyá, Gargi, Váchaknavi, Vadavá, Prátitheyi, Sulabhá, Maitréyi, Kaholan, Kaushítakan, Mahá Kaushítakan, Paijyan, Mahá-paijyan,* Sujajuan, Sánkhyáyanam, Aitaréyan, Mahaitaréyan, Sákalan, Báshkalan, Sujátavaktram, Audaváhim, Mahandaváhim, Saujámim, Saunakam, Aswaláyanam, yé chányé ácháryás, té sarvé tripyantw iti.

The divisions of the single Mandalas are as follow :

1. Mand. the Mandala of the Satarchina Rishis, containing in 24 Anuvákas 191 Súktas (hymns) by Rishis of different families, includes Asht I. to II. adhyáya 5, varga 16.

2. Mandala, the Mandala of Gṛitsamada. Ast. II. 5, 17 to 8, 12. 4 Anuvákas, 42 súktas (an. 1 súkt 4—7, are ascribed to Somáhuti, the son of Bhrigu. Anv. 3, 5—7, to Kúrma, the son of Gṛitsamada, or to the latter himself.)

* MS. 986 has the same reading; but MS. 1839, E. J. II. give the correct one, Pamjyan, Mahápanjyan.

3. Mand. Viswámitra. Asht. II. 8, 13 to III. 4, 11—5 Anuv. 62 súkt. (anuv. 5, súkt. 1—3—are ascribed to Prajápati, the son of Viswámitra, or of Vák (goddess of speech.)

4. Mand. Vámadéva. Asht. III. 4, 12 to 5, 11.—5 Anuv. 57 súkt.

5. Mand. Atri and Rishi of his tribe. Asht. III. 8, 12 to IV. 4, 34—6 Anuv. 79 súkt.

6. Mand. Bharadvāja. Asht. IV. 4, 39 to V. 1, 21—6 Anuv. 75 súkt.

7. Mand. Vasishtha. Asht. V. 1, 23 to 7, 9—6 Anuv. 104 súkt. (Kumára, son of Agni or Vasishtha, is the author of anuv. 6 súkt. 12 to 13).

8. Mand. Asht. V. 7, 10 to VI. 7, 15—10 anuv. 101 súkt. This was before mentioned under the name of Pragathás, according to the commentators a hymn, of which the uneven verses are bhṛati, the even verses sato-bhṛati, that is to say, a hymn composed of verses of four lines, and of which the first line contains two padas of 8 syllables each, while the second, third and fourth lines are composed of a pada of 12, and another pada of 8 syllables. As this Mandala commences with a Pragátha of the kind, which is ascribed to Pragátha, the son of Kanwa, and moreover contains some other hymns of the same Rishi, the name is probably a quibble on the two meanings of the word. The greater number of the Rishis belong to the family of Kanwa.

9. Mand. Asht. VI. 7, 15, to VII. 5, 28—7 anuv. 114 súkt. The Pavamányas (probably richas) or according to the commentary of the Anukramaniká pávamánan saumyan maṇḍalam, hymns of purification.—The hymns of this book, for the greater part ascribed to the Agirāsides, refer without exception to the extracting and purification of the juice of the Soma-plant.

10. Mand. Asht. VII. 5, 29 to the end. The Kshudrasúktás and Mahásúktás, 12 anuv. and 192 súktas.

The name of the 9th Mandala, is found in Yáskás Nir, X. 2, tasya pávamánishn nidarsanáyodá harishyáma ; " " to prove this we shall take an example from the pávamányas ;" he then gives the quotation from the 9th Mandala.

There is in this Veda something quite peculiar which is in connexion with the division above mentioned, and which to a certain degree may

be considered to bear evidence to its (of the division's) authority, viz. the frequent introductions of more or less long episodes between the Anuvākas or Mandalas. We are justified in marking these episodes, which generally are without accents, as additions, by the circumstance, that they are not found in the Anukramanikā and Pada-pāṭha. Nor are they in the division made according to Ashtakas; that is to say, although occurring in the MSS. following this division, they are not taken heed of in the enumeration of Vargas and Adhyāyas, which is made according to a certain numerical arrangement. Agreeably to these authorities Sāyana also omits them. That these additions, however, are not a new creation of the copyists, is evident from the fact, that the Nirukta already knows some of them, and in the very same places, where they now occur in our copies of the Vēda.—I quote the more examples such as these, as this kind of critical examination of the text is undoubtedly the only one which we can make use of, with reference to the Vēda; for in the whole Sanhitā of the Rīgvēda I have not met with a single passage, which, when compared with other MSS. or such books as the Nirukta, the Aitarēya Brāhmaṇa, the Sūtras of Aswalāyana, which are full of quotations from the Vēda, offer one single difference—a certainty of the text which is to be attributed to the early examination and authentication of the Vēda. All variations, it appears, must be looked for previously to the recording of the hymns by writing and to the treatment of the same in the schools. All these differences are now limited only to the various readings of the text in the several collections of hymns.

The two most careful copies of the Sanhitās which I examined, viz. Nos. 199 and 200 of the Dévanāgarī MSS. in the Royal Library at Paris, and Nos. 129—132 of the E. J. H. (Cod. Colebr.) give between the third and fourth chapters of the 9th book (132 with the special title of Sūkta) 20 verses, addressed to the Pāramānyas (the hymns of the Soma-purification) themselves, and for this reason they must be considered of later origin. This section is wanting in the Anukramanikā and in the text of Padas, although Yāska quotes the third Rīg (Nir. V. 6.)

At the close of the second Mandala (ascribed to Gṛtsamada) the two MSS. alluded to, give five verses (without accents in either, while the preceding and subsequent portions have accents) which bear a like-

ness to some of the Atharva hymns, and are evidently added to the two preceding hymns on account of the identity of the subject. They are neither in the Padapáṭha and Anakramaniká nor with Sáyana. I quote them here to furnish an example of this later formal kind of poetry.

- 1.—bhadran vada dakṣiṇato, bhadram uttarato vada |
bhadran purastán no vada, bhadran paschát kapingala ||
- 2.—bhadran vada putrair bhadran vada grihészṇ cha |
bhadran asmákan vada bhadran no abhayan vada ||
- 3.—bhadran adhistán no vada bhadram uparishṭán no vada |
bhadran bhadran na ávada bhadran na : sarvato vada ||
- 4.—asapatnan purastán na : sivan dakṣiṇatas kridhi |
abhayan satatan paschád bhadram uttarato grihé ||
- 5.—yauvanáni mahayasi jigyuśhám iva dundubhi : |
sakuntaka pradakṣiṇan satapatrábhi no vada |

Yáska cites the first Rig of this Súkta (Nir. IX. 5), and expressly ascribes it to Gṛtsanada ; he has, however, the various reading Kapinjála. We observe, that what has been said about the absemet of various readings, does by no means apply to these additions ; to which the following quotation bears a further evidence.* Mand. VII. anuv. 6. at the conclusion of the hymn above alluded to, which is addressed to the frogs, we find a verse not enumerated in the Annkramaniká, and also omitted in the Padapáṭha and in Sáyana, which differs even in metre from the hymn to which it is added. In most of the MSS. it runs thus :

upaplavada, maṇḍúki, varsham ávada táduri |
madhyé hradasya plavaswa vigrihya satura : pada : †

I have compared for this passage seven MSS., viz. those of Paris, Nos. 131, 2135, 1691, and No. 2379, of the E. I. II., and two MSS. from Oxford (without numbers.) With the exception of No. 2379, E. J. II., all of them give this verse. No. 1,621, E. I. II., and one of the Oxford MSS. mark it as Parisishtam (omitted) which is the common way of introducing an interpolation. It is ascribed by Yáska to Vasishta, and closely follows the first Rig of that hymn, to which it is also added in the Nirukta. The three MSS. of the Nirukta, compared

* This passage, however, is only met with at the end of a Súkta, not of a Anuvaka.

† Others read : upaplavata, upaplavada, maṇḍúká, plavasya, paras. The more exact examination of this passage shall be made by me in the Nirukta.

by me, offer the same variations. Now the identical verse occurs in a passage of the Atharvana Saṁhita (IV. 15, 14) in the same manner closely following the Rig, which is the commencement of Mand. VI. 6, 14. (according to the Atharva, MSS. Nos. 1, 137 and 682, E. J. II., as above, save upapavada.) It has therefore almost the appearance, as if Yāska had at the same time referred to either Vēda, to the Atharva for the similarity of the connexion, and to the Rig for mentioning Vasishtha as author, and it is very probable, that the verse has found its way into the Rig, and into that very hymn in consequence of having been mixed up with fragments of the same (hymn) in the Atharvana Saṁhita. That in general a great number of such interpolations owes its origin to the Atharva, has been always my opinion, which we shall have the means of proving, after we know this Vēda more exactly, although the examination of the same, in want of all Indian aids, requires an editor extensively read in Vēdic literature.*

Of a very different kind are additions, which occur only in one or the other of the MSS., and generally present all the colours of later poetry. Thus gives the Paris MS. a long hymn, addressed to Sri. The same MS. and No. 131, E. J. II., present at the end of Anuv. 3 of the 7th book an interpolation, bearing evidence to the worship of serpents.†

An edition of the Riksaṁhita cannot of course reject such of these passages as are found in agreement with each other in the greater number of MSS., because they are undoubtedly interesting to us, and, as has been proved before, must have been introduced in a comparatively remote period. On the other hand, the additions that occur only in one or the other MS. and are stamped with the decisive character of a later time, should at least not be taken into the text. The result which we arrive at relative to the history of the Vedic texts, from such scattered remarks as we have made, is perfectly consonant to the conclusion we derive from the Prātisākhya Sūtras. It is evident,

* To be complete, I give another example. The Brīhati, quoted in the Nirukta IX. 29, á ratri páthivan etc. is interpolated at the end of Riksanh. M. X. 10, 15 (and does not even occur in No. 132 E. J. H.)

† I found the same passage also in a Paris MS. of the title of Mantra Saṁhitá, chiefly giving parallel passages from the Rig. (Erl. 94, 6) but am unfortunately unable to state, whether it follows the same hymn, to which it succeeds in the Rig, as I was at that time not aware, of the presence of this section in the Rig.

that these texts at an ancient time were already perfectly authenticated, arranged and divided. None dared to alter them; additions were ventured at only between the divisions. The Anukramaniká, perhaps from time immemorial, protected the original text from coalescing with the additions of a later period. Although I am not as yet able to prove that Yáska knew this index to the Veda, yet I have not found any evidence to the contrary, and I do not hesitate to consider it more ancient than the Nirukta.

It has been before incidentally mentioned, that the Ashtaka division goes along with the Anukramaniká. As far as I know, they differ in a single instance only,—viz. the fourth Adhyáya of the 6th Ashtaka, as it now is found in the MSS., gives 54 Vargas, although it should according to the rule have only 30 to 35. Here then must be something superfluous, which does not originally belong to the Ashtaka division. Which part is superadded, we may perceive for instance from Sáyana's commentary, which agreeably to the other division, closes the 6th Anuváka with the 15th Varga, and commences the 7th with the 32 (of the MSS., according to him the 14th.) The Vargas 14 to 31 (of the MSS.) do therefore not originally belong to the Ashtaka division. The Anukramaniká, on the other hand, enumerates them and gives also the names of their authors. They accordingly appear to have been included in the Mandala-division. To explain this deviation, it might be either supposed, that the enumeration of these 18 Vargas in the Anukramaniká is spurious, which would be supported by the omission of the whole passage in the commentary of Shadgurnishya to the Anukramaniká (according to two MSS. 1832 or 2396, E. J. II.) or it might be supposed, that at a later period these 18 Vargas were considered an independent section, consonant to itself, which might be separated from the collection of the hymns of the Rig. To this view refers the circumstance, that this passage, for instance in MS. 131, E. J. II., has the separate title Váakhilyam, (and it concludes with Váakhilyán samáptam) and the statement of Sáyana in his commentary to the Aitareya Bráhmaṇa VI. 28 (where also, c. 24, a fabulous derivation of the word is given) Váakhilyákhyair munibhir drishtá "abhi praityádiké 'shtake sthítá richo Váakhilyábhídhá : ta éva váakhilyákhyé granthé samámnátá : tá : sarvá Maitrávaruna : sansét" (MS. 1836 E. J. C.)

“The verses, composed by the sages Válahkilya, which occur in the 8 hymns commencing with abhi pra, are called Válahkilya. They are recorded in the book, called Válahkilyam. To recite all such hymns is the duty of the Maitrávaruna” (a certain priest.)

By this statement of Sáyana some clue may perhaps be given, how the Rik-Sanhitá can include some greater or lesser portions, which, having an independent existence and being already arranged in a certain succession, may among certain tribes have had an authority at the performance of some peculiar sacrificial ceremonies. Even the passage of the Aitareya Bráhmāna just mentioned notices a peculiar application of the Válahkilya in the sacrifice.

2. *The reading of the Veda in the School.*

I now give an extract from the 15th Paṭala of the first Prátiśakhya (according to Dev. 203 Royal Libr. at Paris and 28 of the E. J. H.) This chapter treats on the Páráyaṇa, or reading of the Veda, and we learn from it, how the mode of recital, prescribed in the same, is exactly the same oral proceeding, which is performed in writing within the Páṭhas or modes of writing we shall further on more closely discuss.

When the teacher has seated himself towards the East, the North and North-East, and has received the salutation from his disciples, he replies to them by an Om of 3 to 6 Mátrás, and then commences to recite the Veda. Two or more words having been recited by him, they are repeated by the disciple, sitting to his right, and afterwards by the others in succession. A Prasna thus completed is also repeated by all of them. Lastly the passage of the text is to be repeated in such a manner, that, as in the Padapáṭha, certain compounds are separated, and accompanied with the particles cha, gha, hi, vá, and under certain conditions with iti, just as is the case with prepositions.

A prasna, it is said, is a tricha (three verses) in the metre pankti a tricha or dwricha (two verses) in longer metres two and two verses. If a Sūkta (hymn) is limited to one verse (of which the only instance is Asht. I. h. 99) it forms a Prasna.

Yé (viz. prasná :) shashtir adhyáyé upádhiká va. “Of such questions (or small sections) the lesson contains 60 or more.” (vide supr.)

3. The following fragments, which are moreover remarkable for the geographical names they contain, may be given as examples of

the envious personifications, by which in the Atharvéda, animals, plants and even diseases are invoked. The passage is taken from K. V. 22, (according to the Paris MS. and No. 682 E. J. II.)

Agnis takmánam apabádhatám ita : somo, grává, varuṇa : pútaḍakshá :
védír, barhi : samidha : sosucháná apa dwésháśy amuyá bhavantu || 1
ayan yo viswán haritán kṛinoshy | nehehochayann agnir ivábhidunwan |
adhá hi, takmann, araso hi bhúyá | adhá jnann adharán vá paréhi || 2

Oko asya Mújavanta, oko asya Mahávrishá : |
Yávaj játas, takmans, táván asi Vahlikéshu nyochara : 5*
takman, Mújavato, gacha, Vahlikán vá parastarán |
Súdram icha prabharoyau, tán takman, víva dhánuli | 7
Mahávrishán, Mújavato bandhv addhi parétya | **
praitáni takmané brúmo anya-kshétráni vá imá || 8
Takman bhrátrá balásena swasrá kásikayá saha |
Pámná bhrátrivýēna saha gachánun arānan janān || 12
Gandháríbhya, Mújavabhya, 'njébhya, Magadhébhya : |
praishyan janam iva sévadhim takmánan paridadnasi || 14

1. Agni, drive away from here Takman (may drive him away) Soma, the (sacrificial) stone, Varuna of pure strength, the fire-place, the sacred straw, the burning wood. Be away from here envious men.

2. Thou who maketh yellow the whole body, who giveth pain like fire when burning upwards, thou, O Takman, nevertheless, lose thy power, pass by, moving downwards or from underneath.

3. His house are the Mújavat, his house the Mahávrishá ; whenever thou art born, O Takman, thou goest to the Vahlíka.

7. Go to the Mújavat, Takman, or to the distant Vahlíka, desire the Súdra for nourishment. These, O Takman, somewhat shake.

8. Devour the Mahávrishas, the Mújavats, passing over from us ; we leave these or other foreign countries to Takman.

12. Takman, with thy brother Balása (dejection) with thy sister Kásiká (cough) with thy brother's son Páman (itching) go to that foreign people.

13. We give Takman as a messenger, as a treasure, to the Gandhárís, the Mújavats, to the Angas and Magadhas.

* I am unable to correct the gnykaras after two MSS. No. 682 E. J. II. read Vahlikésa gnyokara : | the meaning, however, is evident.

It is evident, that under Takman some disease must be understood, but which, the passage does not define. K. V. 4 is invoked the medicinal herb Kushta, which grows on the Himavat, and is repeatedly called takmanāsana (destroyer of Takman); according to Wilson kushṭa is the plant *Costus speciosus*. The variety in writing must undoubtedly be ascribed to the MS., and as kushṭha means also leprosis, and the plant probably has the name from its power to heal that disease, takman, no doubt, signifies a similar cutaneous disease, to which the 2 rig alludes.

To 5. I meet again with the Mújavats in the Vajasanéyasanhita III. 61 état té Rudrávasan téna paro Mújavata 'tíhi | avatata-dhanwá piná kávasa: Krittivásá ahinsan na: sivo 'tíhi | (according to No. 2391, E. J. H.) "This is your travelling fare, Rudra; with this proceed further far to the Mújavats. With bow unbent; the staff in hand, clothed with skins, without harming us, may he graciously proceed on." Mahídharma explains the Mújavatas, as follows: Mújaván náma kachit parvato Rudrasya vámasthánam | . . . mújavata: parvatán pá: pábhágavartí (para: parabhágavartí) san, atikramya gacha: "Mújavat is the name of a mountain, the favourite abode of Rudra, &c. therefore proceed beyond the Mújavat mountains." Durga, the commentator of the Nirukta (ap. I. C.) simply explains the word by parvatát, and consequently takes it as the ablative. According to Nirukta IX. 8, Mújaván is the same with parvata, and we find in Rik. X. 3, 5, 1, somasyéva maujavatasya bhaksha; as the enjoyment of the mountain-born Soma. The Mújavats are therefore mountaineers, and as they in V. 7, are mentioned in connexion with the Vahlikas, and V. 14, in connexion with the Gandhárís, we have to consider them mountainous tribes to the N. W. The Mahávríchas (magni libatores or validi progenitores) according to V. 5 and 8 must be assigned to the same countries. All agree, that the Vahlikas are a Bactrian nation. (Lassen, Zeitschrift II. p. 53 etc. Wilson, Vishnu P. p. 191.)

Prabharyan (681, E. J. H. reads, however, Prapharvyan) from bharvati, according to Naigh. II. 7, attikarmá, consonantly to the Nirukta IX. 23, where we meet with the proper name of Súbharva. That we have under the name of Súdra not to think of the later caste, but of a nation of this name, appears to me beyond doubt, until the castes can be traced in the Védic hymns. I am not aware of any such

passage. (The Xndra or the Sqndra of the cuneiform inscriptions of Persepolis cannot well be here expected) ; with Lassen we must consider them the *Συδράκαι* (or *Ὀξυδράκαι*) who appear to the N. W. of the Indus. See also Wilson's Vish. P. p. 195.

12. The meaning of *araṇa* as foreign, distant, is authorized by the passages in the Rik. X. 5, 3, 16. *Sá no amá so araṇe nípātu*, she may protect us when near, she may protect us, when distant (in foreign parts, in and out of the house. Durga's Commentary on Nirukta. xi. 46.) Nir. III. 2. *parishadyan hy araṇasya rekṇo nityasya ráya : pataya ; syáma ;* "for we must avoid *foreign* property, may we be lords of perpetual property" (Durga on Nir. III. 2, where there is the question of possessing children, *araṇa-parakulajáta*. Sayána ad. I. without any reason *anriṇa*.)

14. Lassen has at several places with full certainty assigned to the Gandharas the eastern Kabulistan as their original abode. From Védic works I can only add, that the wool-clad sheep of the same were famous, according to Rig. I. 18, 6, 7. *romasá Gandhárinám iváviká*, haired (woolly), like a sheep of the Gandharas. In the Aitareya Bráhmāna VII. 34, there appears *Najnañit*, the Gandhara, among those who have learnt from Parvata and Nárada the knowledge of a certain ritual. From the nation of the Gandharas extending into the Punjaub it can be explained, that one of their princes appears among such as are under the protection of the Bráhmanical worship, while the nation in the passage of the Atharva alluded to is counted among the foreign and distant nations.

As the Anga, also in the poetry of a later period frequently referred to, must be supposed to have had their abodes on the Ganges about Bhágalpur, and the Magadhas in South Behár, we have in v. 14 two and two nations for the two frontiers in N. W. and S. E., consequently at the time of the composition of this hymn, the country of the Bráhmanical worship appears to have been comprehended by these two extremes, and the country beyond the river Souá (Sone) to have been considered not Indian.

Sévadhi has not yet obtained in ancient Sanserit the meaning of a treasure of Kuvéra. Nir. II. 4, it is identified with *nidhi*, compare Rik. Asht. VI, 4, 19 *sévadhipá*.

As an example of another kind of incantation the following verses may be considered. Ath Sanh. III. 2.

Munchāmi twá havishá jivanāya kam Ajuāta jakshimād utá rajá
jākshimāt ।

Grāhir jagráha yady étad énam tasyá Indrágni pramumuktam énam ॥ 1

Yadi kshitáyur, yadi vá paréto, yadi mityor antikam níta éva ।

Tam áharāmi nirritér npasthád aspársam énam sata sárādāya ॥ 2

1. With this havish (sacrificial butter) I liberate thee for thy life, from the concealed consumption or from the pulmonal consumption; when the attacker has attacked him, then liberate him from the same, Indra and Agni.

2. If his life be consumed, or if he went already, or if he has been led near to death, then I will bring him back from the brink of death uninfested to a life of a 100 years.

4. Atharvana Sanhitá, K. IV. 29. (M. 682. E. J. II.)

Manwé vá Mitrá Varunáv ritávriddhau sachétasau druhvāno jau nudéthé ।

Pra satyávānam avatho bharéshu tau no munchatam anhasa : ॥ 1

Sachétasau druhvāno jau nudéthé pra Satiávānam avatho bharéshu ।

yav gachatho nrihakshasau babhrú ná sutan tau no . . . ॥ 2

yáu Angirasam avatho । jau Vasishthan tau no . . . ॥ 3

yau Syávāshwam avatho, Vadhryaswan, Mitrá-Varuná, Purumilham,
Atrim ।

yau Vimadam avatha : Suptavadhri tau no . . . ॥ 4

yau Bharadvājam avatho, yau Gavishthiran, Viswāmitran, Varuṇa
Mitra, Kutsan ।

yau Kakshivāntam avatha : prota kanwan tau no . . . ॥ 5

yan Medhātithim avatho, yau Trisokan, Mitrá-Varunáv, Usanām
Kávyan yau ।

yau Gotamam avatha : prota Mudgalan tau no . . . ॥ 6

yayo ratha : satyavartma 'rjunasmir mithuyá charantam abhiyāti
hrishayan ।

Stanmi Mitrá-Varuṇau náthito johavími tau no munchatam anhasa ॥ 7

1. My mind is directed to you, Mitra and Varuna, you that increase what is right, you of benevolent mind that repel all that is hostile, that protected Sátyávan in his fights. Do liberate us from peril.

2. You benevolent who repel the enemies, who protected Satiávan in his fights, who approach (for assistance) you guides of men, as the horses of Indra to the libation.—Do liberate, etc.

3. Who protected Angirasa, and Agasti, Mitra and Varuna, Jamadagni and Atri, who protected Kasyapa and Vasilthia. Do liberate, etc.

4. Who protected Syāvashwa, Vadhryaswa, Mitra and Varuna, Purumilha, Atri, who protected Vimada, Sáptavadhri. Do liberate, etc.

5. Who protected Bharadvāja, Gavishthira, Viswamitra, Varuna, Mitra, Kutsa, who protected Kakshivat and Kanwa. Do liberate, etc.

6. Who protected Medhātithi, Trisoka, Mitra, Varuna, Usana, the son of Kaviya, Gotama, Mudgala. Do, etc.

7. The Chariot of whom running on the right road, with tight rein, overjoyed passes the racing.

I praise you, Mitra and Varuna, I invoke you praying.

I here give the proof, that the greater number of the persons, mentioned in the hymn, are Védic Rishis.

Jamadagni is (according to the Anukramaniká and other sources) author of VIII. 10, 8. IX. 3, 2, 3, 6. 3, 7, 6. IX, 7, 4, 6. X 10, 11, 12, 16. 22.—Atri, author of several hymns in the 5th book, Kasyapa for I, 15, 6. VIII. 4, 9. IX. 3, 4. 3, 7, 2. 5, 6. 5. 7. 7, 4, 2. IX. 7, 10. The whole 7th book and several parts of the 9th are ascribed to Vasishta. Syáswa (from Atris' family) V. 4, 8 to 5, 5. 5, 10. 6, 9, and 10. VIII. 5, 5 to 8. IX. 2. 8. Purumilha (with Ajamitha, both sons of Suhotra) IV. 4, 11 and 12. VIII. 2, 8. Saptavadhri (from Atris' family) V, 6, 6. To Bharadvāja the greater number of the hymns of the 6th book is attributed, to Viswamitra the third book, Gavishthira (with Buddhu) V. 1. 1. Kutsa 1, 15, 1 to 5. 15, 8 to 16, 10. IX, 6, 1, 45 to 58. Kakshivat 1, 17, 1 to 18, 6. IX, 4, 7. Kanwa, 1, 1 to 8. IX. 5, 9. Medhātithi, 1, 4, 1 to 5, 4, and several hymns of the 8th book. Trisoka (from Kanwar family) VIII, 6, 3, 3. Usanas IX, 1, 4. 5, 2 to 4. Gotama I an. 13 to 14, and some parts of the 9th book Mudgala, son of Bhrimyaswās, is named as the author of X, 9, 3.

5. There is in the Library of the East India House and among Professor Wilson's books deposited in the Bodleyan Library at Oxford, a very extensive collection of these liturgical Sūtras, of which the greater number has not found a commentator. Those that I saw are the Sūtras of Aswaláyana, Apastamba, Drágháyana, Kátyáyana, Látyáyana, Sankhyáyana, Gobhila and Boudhdháyana. Aswaláyana's Sūtras, with which I am best acquainted, appear, to judge only from

the great number of copies, to have been most extensively known. The first section of the same, the Śrautasūtra, consists of two parts of 6 adhyāya each, the second part, the Grihyasūtra, is divided into four adhyāya. We have a commentary to this by Nārāyaṇa, of which the East India House possesses at least the division for the first 6 sections of the Śrauta, and for the Grihyasūtras. Aswalāyana's Sūtras also refer to more ancient works, for instance to the Aitareya Brāhmaṇa, from which at several places pretty extensive extracts are given (even without mentioning the source) further to the Kausītaka and to ancient teachers, for instance Kantsa, Gautama, Gāṇagāri, Taulvali, Sādyāyana, Samaka, etc.

6. In a similar way we shall be able on the other side to arrive at a determination of the mutual relation of the Vedic and Epic writings in respect of age and origin.

I confess that I have not yet been able to convince myself that the Mahābhārata even in respect of its fundamental component parts reached back into the Anti-Buddhist period. I have the same doubt in regard to the Rāmāyana. Before the founding of Buddhism, and contemporaneously with it, must be placed the era of Vedic authorship, in which—so to express myself,—the practical consequences were drawn from that treasure of the oldest theology, which is laid up in the hymns. This is the liturgical period to which the books belong which under the names of Brāhmaṇa and the like have come down to us. The priests fashioned the worship (Cultus) and the worship fashioned the priests. At that time the proper Veda, i. e. the hymns, were not indeed historically comprehended, but yet exactly known; people tried to understand them by the help of grammars and exegesis. One portion of the latter is the construction of legends (itihāsa, ākhyāna,) from the text of the hymns, and it must be confessed of these relations, that with the exception of those turns which have a liturgical aim, the most of them are confined within the limits of historical possibility, so far as this point can naturally come into question with the Indian.

But in both the Epic poems quite another aspect of things begins. The Veda is only imperfectly known; the ritual no longer struggles after development, it is complete; the Vedic legends have entirely detached themselves from their root; and quite a different worship has taken the place of the religion of Agni, Indra, Mitra and Varuṇa. The

last named fact specifically should most of all have demonstrative force. There runs through the whole of the Indian religious-life an historical sunderance,* from the time of the Rámáyana down to the present day. The worship is Vedic, and indeed exclusively Vedic, while the religious view is turned to quite different forms. This second structure, the religion of Vishnu and Bráhmá, begins with the Epopees, and is thenceforth the only one which has retained vitality, but it has not had the strength to break down the walls of the Vedic institution, and form itself into a ritual in its room. Similar appearances, though less abrupt, will be shown by a scrupulous historical investigation in all the more important religious systems; the Grecian mysteries, e. g. will be seen to have their root in no other relation than that of the original and old, to the transformed and new; that in Egypt such new formations, and the simultaneous existence of various systems have occurred, is still less doubtful; and religious history might propose to itself for its theme, sunderance and separation far more than combination. Finally, there rules in the Puránas—I am not afraid to say it,—a complete misunderstanding of Vedic antiquity, and all that is connected therewith, a fundamental ignorance of the Vedic writings, on the origin and division of which so much is fabled. And for the explanation of that foretime they (the Puránas) will be useful far less immediately, than mediately, on this account that we accidentally meet again in the later tales, with results found elsewhere and independent of them, and are able gradually to form a standard to try the historical value of these legends.

Research into the historical relation of the Veda and the Epopees must keep these circumstances in view. The following appears to me to be a practicable mode of determining more nearly the interval of time which lies between the two. It is well known that the Anukramaniká very frequently gives short legends, solely with the object of illustrating the origin of the hymns. This happens more amply, and with the same view, in the Vrihaddevatá ascribed to Saunaka, a book composed in metre, of which I have been unable to discover any copy in England, but which in all probability will yet be found in India. The commentator of the Anukramaniká to the Rik, Shadgurnisishya, knows this writing and cites it frequently, and Sáyana often gives longer

* Zwiespalt; splitting into twain.

extracts from it in his commentary. More valuable still than these notices are indisputably those representations of the old tales, which we find in the Bráhmānas. The Aitareya Bráhmāna gives a considerable number of them, and among these most amply the history of Súnahsepha (VII. 13 to 18).^{*} Not less rich is the Taittiríya Saṁhitá, and to judge by citations,—the Kāṁśhitaka, Tándya, and other writings of this kind.

After this would come the task of following the progressive formation or even declension of the legends from their origin onward through all these branches and transformations, to determine from what source they have flowed into the Epopees, or—if no written source could be assumed for them—at what stage of development, the tale stood, when it passed into these poems. From the richness and variety of these narrations and the great number of writings which lie open to us for comparison, it should be possible to arrive at an approximative result. The chronological sequence of the preceding writings, of the discovery of which we certainly may not doubt, would then transmit to us downward from above the relative date for the origin of the epic books.

7. As a proof, that the authors of the Bráhmāna were acquainted with grammar as a science, may be considered the greater number of the derivations of words, belonging equally to etymology and grammar, by which those writings are corroborating their doctrines.

It may here suffice to quote one passage, in which a technical term of grammar is met with. It is taken from the Aitareya Bráhmāna, VII. 30.

Athásyaisha swa bhaksho, nyagrodhasyávarodhāns cha phalāni
chaudumbarāny, áswatthāni, plákshāny abhishunuyát. táni bhakshayét,
so ashya swo bhaksho. yato vá adhidéva yajnénéshtwá swargan lokam
áyans tatraitāns chamasān nyubjans, té nyagrodhá abhavan, nyubjan
iti hápy énáṁ étarhy áchakshaté Kuru kshétre téha prathamajan nyagro-
dhánán, tébhyo hánya 'dhijátas. te yan nyaneho 'rohaus, tasmán
(nyán rohati nyagroha) nyagroho vai náma. tan nyagrohan santan
nyagrodhan ity áchakshate parokshéna, paroksha-priyá iva hi déva : 1

^{*} This remarkable legend bears, in the representation in the Bráhmāna, a peculiar stamp of antiquity. As the same tale is treated diffusely in the Rámáyana, is doubtless also related in the Mahábhárata, is found in the Purānas, and is also mentioned elsewhere, e. g. in Manu, it might supply a fit example to exhibit the mode in which legends are developed.

“The food proper for the Kishatriya, is the following. Let him extract out the produce of what is growing downward from the Nyagrodha, (i. e. of the stems which rise from the branches of the Banyan tree,) fixed in the ground, and the fruits of the Udumbara (*Ficus racemosa*) of the Aswattha (*Ficus Indica*), of the Plaksha (*Ficus infectoria*). All such let him eat; it is his proper food; for when the supreme gods after the performance of the sacrifice went to heaven, they upset their sacrificial vessels. Hence arose the Nyagrodha-trees. For this reason those trees are called upset (bent) in Kurukshétra (where the sacrifice took place) these were the primitive stems of the Nyagrodha, from these others were produced, which were called nyagrodha (growing downwards) because they were bent downward. The nyagrodha is called nyagrodha after the mysterious (etymology) for the gods like mystery.”

The last remark is repeated in the following chapter of the Bráhmaṇa, and frequently at other places. What is meant by the mysterious formation of a word, the paraksha formation, I will illustrate by a passage of the commentary to the Nirukta (ad. I. 1.) Durga says: trividhá hi sabda-vyavasthá, prathyaksha-vrittaya: paroksha vrittaya: atiparoksha-vrittayascha. tatrotkariyá: pratyaksha-vrittaya: antalína-kriya: paroksha-vrittaya: atiparoksha-vrittishu sabdeshu nirvachanábhyapáyas, tasmát paroksha-vrittítám ápadya pratyakshavritiná sabdēna nirvaktaryás. The example which was the occasion of Durga's remark, is the word nighanṭu, nighanṭavas, where he says, atiparoksha-vritti, nighanṭavas is parokshavritti, and nigamayítáras is pratyaksha-vritti. One sees without difficulty, that the word paroksha in the meaning it has in the Bráhmaṇa, necessarily refers to the existence of that grammatical terminology which is explained by Durga.

8. Dévarāja in the commentary to the Naighantuka (pro. 1134, E. I. II. pol. I.) mentions the following names of persons to whom commentaries of the Védas (véda bháshyáni) are ascribed: Skanda-swámi (who after the same authority wrote a gloss to the Nirukta) Bhavaswámi, Guhadéva, Srinivása, Mádhavadéva Uvāṭa (otherwise Uvāṭa, of whom Colebrooke, Ess. I. 99, compare also p. 54, note, possessed fragments and who made commentaries to two Prátisakhya sūtras, of which afterwards) Bhaṭṭa Bháskara Misra, Bharataswámi.

Note to accompany a Chart of the Bay of Bengal, with the average courses of its Hurricanes from A. D. 1800 to 1846.—BY HENRY PIDDINGTON.

This Chart is the third of a series now printing for a new work on Storms, which it is hoped will be for the Mariner in all parts of the world, what the “*Horn Book of Storms*” is for the Eastern Seas, from the Cape to China, and I have thought this chart of sufficient general scientific interest to offer copies of it to the Editors of the Journal.

It may be regarded both in a meteorological and a nautical point of view, and further as a contribution to general science, for to advert first to this last named view, it will not be thought trifling that we are now enabled to say by the researches of Mr. Redfield and Col. Reid for the Atlantic Ocean for 66 years (1780 to 1846) those of Col. Reid, Mr. Thom and my own for the Southern Indian Ocean for 35 years (1809 to 1846), my researches for the Bay of Bengal for 46 years, 1800 to 1846, and in the China Sea for 66 years, 1780 to 1846, and my researches over all the other portions of the globe wherever I could obtain documents, as the Pacific Ocean, coasts of Australia, &c. no contradiction to the great laws which Redfield and Reid have announced has been discovered, and this though every apparent anomaly has been subjected to the closest scrutiny! The researches too have been carried out to an extent which few are aware of, as both to the various sources referred to and their number. Hence we may look upon this Chart as part of the results of a series of registries of independent experiments recorded without the least concurrence on the part of the registrars,* and this evidence of the clearest and highest order to the truth of a great physical law.

And this relates to the rotation of Storms. What we have now to pursue for separate seas and oceans, and what is in this chart accomplished is, the slow and gradual mapping of their various tracks as completely as it has been done in the West Indies and for the coasts of North America by Redfield and Reid, and for the Bay of Bengal and

* The experiment, i. e. the storm, is made for us, but the seaman varies it by the different manœuvres he executes to get through it. On shore we sit still in our houses and register nothing more.

China Sea by myself; for without a knowledge of the average tracks the problem of the management of a vessel becomes much more intricate for the seaman; since it is upon the track of the Storm (as upon that of a pirate or enemy) that his manœuvres must depend, and this he must know or know how to calculate. Hence the importance of this chart in a nautical point of view.

There is one more relation in which I venture to present it, and that is the following. If we produce by the eye or a ruler the various tracks of the Storms backwards to the Eastward on the same line we shall find them all *tending* as it were, to some focus of volcanic action now in activity. Beginning from the South, the first set appear to come from some of the numerous Sumatran Volcanoes or of the Volcanic islands which fringe its coasts. The next set, and these are the most remarkable, will mostly be found to arise about Barren Island, which is a Volcano always in activity, and to run towards points between the West and N. N. W., while a third, the Dacca and Kyook Phyoo hurricanes seem traceable from the volcanic centres of Cheduba (or Chittagong.)

It is difficult to say that these coincidences are not more than accidental, but I shall best explain my general views on the subject by the following, copied from my forth-coming work, p. 19, par. 33 :—

“ Other suggestions have been thrown out and instances adduced by different writers as to the possibility of volcanoes, and even fires, originating violent circular motions of the atmosphere, and that volcanic eruptions are often accompanied by violent storms and heavy falls of rain, there is no doubt. I have myself pointed out, though my published Researches have hitherto been confined like those of Redfield and Reid to the effects, as the sure eventual index to guide us backward to the causes of Storms, that in the China Sea and Bay of Bengal* there is much to countenance the idea that Storms in some parts of the world may originate at great volcanic centres, and I am inclined to believe also that their tracks are partly over the great internal chasms of our globe, by which perhaps the volcanic centres and bands communicate with each other. If we produce at both ends the line of the track of the great Cuba hurricane of 1844, we shall find that it extends from the great and highly active volcano of Cosseguina on the Pacific shore of central America to Hecla in Iceland! and in 1821 the breaking out of the great volcano of Eyafjeld Yokul in Iceland, which had been quiet since 1612, was followed all over Europe by dreadful storms of wind, hail and rain. In Iceland the

* Sixth Memoir, Storms of the China Sea, Journal Asiatic Society, Vol. XI. p. 717.

Barometer fell from the day before the eruption till the twenty-sixth day after.* Mr. Espy quotes several other cases, and Humboldt for South America, to show that nothing is better established than the fact of the connection of volcanoes with rains and storms. Purdy (*Atlantic Memoir*) also alludes to the supposed focus of sub-marine volcanic action on the Equator, in that sea, as the spot to which the southern extremes of the West Indian hurricane tracks would tend, if continued. If I advert to these speculations it is with the hope of drawing the attention of intelligent mariners to them."

* Espy, p. 67, 68, not correctly printed.

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of July, 1847.

Days of the Month.	Maximum Pressure observed at 9h 50m.						Minimum Pressure observed at 4 p. m.						Rain Gauges.
	Barometer reduced to 32° Fahrenheit.	Temperature.		Wind.	Aspect of the Sky.	Barometer reduced to 32° Fahrenheit.	Temperature.		Wind.	Aspect of the Sky.	Maximum Temperature.		
		Of the Air.	Of the Mer.				Of the Air.	Of the Mer.				Direction from sunrise to 9h 50m.	
1	In. 29.554	84.8	84.0	80.8	S. E.	Cloudy.	In. 29.436	88.0	85.0	80.0	S. E.	91.0	
2	.462	89.0	86.0	81.5	S.	Cumulo strati.	.406	86.0	80.5	79.4	S. E.	91.4	
3	.471	87.3	86.1	82.0	S.	Cloudy.	.395	87.0	86.0	81.0	S. E.	91.6	
4	.556	80.5	80.9	77.8	S.	Cloudy.	.499	83.0	83.0	78.4	S. E.	84.0	
5	.651	82.5	81.5	77.0	E.	Cloudy.	.572	88.5	86.5	80.0	S. E.	89.6	
6	.662	89.0	87.8	80.2	S.	Cumulo strati.	.555	94.0	91.5	81.0	S. E.	94.3	
7	.587	89.0	88.0	81.0	S.	Cumulo strati.	.465	91.4	90.6	82.0	S. E.	94.2	
8	.523	89.0	87.5	81.0	S.	Cumuli.	.400	94.5	92.0	83.2	W.	95.9	
9	.517	85.0	85.6	82.0	S.	Cloudy.	.421	89.5	88.5	82.6	S. E.	89.6	
10	.485	85.8	85.0	80.4	S.	Cloudy.	.430	78.0	79.0	77.3	N.	89.0	
11	.485	88.5	87.0	82.0	N. E.	Cloudy.	.400	91.7	89.2	82.2	S. E.	99.2	
12	.517	87.0	87.0	82.0	N. E.	Cloudy.	.417	89.5	88.0	82.3	N. E.	91.4	
13	.485	81.0	81.4	80.0	S.	Cloudy Cirro-Cumuli.	.420	87.0	86.9	82.0	W.	87.2	
14	.519	87.0	85.8	80.8	S.	Rain.	.421	89.8	88.2	81.4	S. E.	91.4	
15	.479	86.8	86.0	82.0	S.	Nimbi.	.392	86.5	86.1	82.8	S. E.	85.8	
16	.518	84.5	84.9	79.8	N.	Cloudy.	.445	86.8	86.0	80.8	S. E.	87.8	
17	.628	85.6	84.0	80.0	S.	Cloudy.	.570	86.0	86.0	79.0	S. E.	91.4	
18	.696	88.0	87.6	80.0	S.	Cumuli.	.606	90.0	88.5	80.2	S. E.	90.0	
19	.669	87.0	86.6	80.5	S.	Cumuli.	.577	87.0	86.8	80.3	S. E.	87.0	
20	.685	81.8	82.0	80.0	S.	Drizzly.	.585	84.3	84.4	79.9	S. E.	87.0	
21	.688	87.0	85.9	79.8	S.	Cirro Cumuli.	.563	89.9	89.0	81.0	S. E.	90.4	
22	.603	90.2	87.8	81.8	S.	Cumulo strati.	.466	95.7	89.4	82.1	S. E.	91.9	
23	.579	85.8	84.9	80.7	S.	Cloudy.	.493	88.0	86.9	82.0	S. E.	89.4	
24	.612	83.1	82.8	79.2	S.	Nimbi.	.534	81.5	81.8	79.0	S. E.	87.9	
25	.613	89.0	87.0	80.0	S.	Cumulo strati.	.534	87.0	85.0	80.5	S. E.	86.4	
26	.635	90.5	89.0	81.9	E.	Ditto.	.551	87.0	83.7	79.0	S. E.	91.1	
27	.647	89.4	86.2	79.8	S.	Ditto.	.582	91.0	89.2	81.5	S. E.	91.1	
28	.708	90.5	87.5	80.7	S.	Ditto.	.623	89.0	87.9	81.0	S. E.	90.4	
29	.725	88.5	88.0	81.8	S.	Ditto.	.626	91.0	89.5	81.8	S. E.	92.5	
30	.710	90.0	88.4	81.4	S.	Ditto.	.593	90.5	90.2	81.3	S. E.	92.8	
31	.639	88.5	88.2	81.9	S.	Ditto.	.523	90.5	90.0	83.0	S. E.	93.8	
	29.501	86.8	85.8	81.9			29.500	88.3	86.9	80.8		91.0	14.14 15.69

PROCEEDINGS
OF THE
ASIATIC SOCIETY OF BENGAL,
FOR JULY, 1847.

The usual monthly meeting of the Asiatic Society was held on Wednesday evening, the 7th July, 1847.

Sir J. P. GRANT, *Vice-President*, in the chair.

The minutes of proceedings of the last meeting were read and adopted, and the accounts and vouchers for June laid on the table.

E. Currie, Esq., C. S. duly proposed and seconded at the June meeting, was ballotted for and elected a member.

The following gentlemen were named as candidates for election at next meeting:—

Capt. J. D. Cunningham, proposed by *J. W. Laidlay, Esq.*, seconded by *Col. Forbes*.

J. Beckwith, Esq., proposed by *W. P. Grant, Esq.*, seconded by *Sir J. P. Grant* and *Col. Forbes*.

William Greenway, Esq., Assay Master, Agra, proposed by *Col. Forbes*, seconded by *Dr. W. B. O'Shaughnessy*.

Read letters from—

The Secretary to the Military Board, forwarding a communication from the Agricultural and Horticultural Society on the timber trees of Bengal, (referred to *Capt. Munro*, who is entrusted with the preparation of a Report on this subject on behalf of the Society.)

From *Mr. Muir*, forwarding his translation from the German of *Dr. Rudolph Roth's* preliminary Essay on the literature and history of the Vedas.

From *Mr. James Corcoran*, submitting a specimen of his Urdu History of the Chinese Empire, and requesting the Society's patronage of the work. (Referred to the Committee of Papers.)

From the Royal Academy of Munich, presenting several works and requesting others in exchange. (Referred to Librarian for Report.)

From Capt. J. D. Cunningham, giving a detailed description of his antiquarian researches during a tour of the districts within the Bhopal Agency.

From Mr. Wattenbach, of Bombay, tendering his resignation as a member of the Asiatic Society, in consequence of his having joined that of Bombay.

From M. T. Fournier, of Cachar, requesting the aid of the Society in the promotion of his researches in natural history, and tendering apparently on sale a "green Serpent," for which he understood the Society had offered "*une belle recompense*."—(Referred to the Committee of Papers.)

From Mr. Ward, presenting a very curious specimen of the growth of *Confervæ* in vinegar.

From Mr. Laidlay, submitting an Essay by Dr. Cantor on the serpents of the Malayan Peninsula.

The Committee of Papers submitted for the decision of the Society,

1.—A proposition from the Senior Secretary, that he be allowed to vacate the Secretaryship to the Meteorological Section, and that Capt. Thuillier, the Officiating Deputy Surveyor General, be appointed in his stead. This proposal was unanimously supported by the Committee on the grounds advanced by the Senior Secretary—the active exertions Capt. Thuillier has made to enable the Society to resume the publication of a Meteorological Register, which is kept with the best instruments in India and by experienced observers, in the Surveyor General's office. Capt. Thuillier's consent had been given to the nomination. (Unanimously approved.)

2.—The probationary period of six months for which the Librarian, Rajendra Lal Mittra had been employed having expired, and his duties having been discharged to the entire satisfaction of the Committee, they recommend his being permanently appointed Librarian to the Society. (Unanimously adopted.)

3.—The Committee communicated correspondence and accounts regarding the outlay on the "Cantor Drawings."

The questions placed before the Society by Circular to the resident members, (subsequent to the last meeting,) regarding Sir Alexander Burnes' Drawings and Mr. Blyth's claim for Rs. 3,200, were brought up and discussed.

(CIRCULAR.)

ASIATIC SOCIETY, ZOOLOGICAL DEPARTMENT.

The Vice-Presidents and Committee of Papers of the Asiatic Society deem it their duty to circulate for the information of the resident members the annexed documents regarding the printing of coloured lithographs of the drawings of the "*Zoology of the Indus*," made under the directions of the late Sir Alexander Burnes and Dr. Lord, and placed at the disposal of the Society by the Supreme Government of India, in 1838.

The original drawings were 146, of which up to October 1846 there had been lithographed and coloured 51—lithographed but not coloured 13—for which there had been paid or remained due Co.'s Rs. 5,797 10 6, for copying, paper, colouring, and printing.—The Committee of Papers with reference to the state of the Society's finances when this account was laid before them, considered it their duty to discontinue any further outlay on the proposed publication, and their recommendation to this effect was unanimously approved of at the January and February meetings of 1847.

The question remained open for consideration how the plates already completed were to be disposed of. No description of the plates was available, the original MS. by Dr. Lord, entrusted to Mr. Blyth in 1842, having been lost by that officer, who had undertaken to supply its place by adequate letter-press by himself. In consideration of this promise and to accelerate its performance, with reference also to his zealous exertions in increasing the Society's collections, the Society (as stated by Messrs. Torrens, Heatly and Frith) at the general meeting of May 1844, undertook to make an addition from that date of 100 Rs. per mensem to Mr. Blyth's salary, payable with all arrears, on the completion of the MS. Of this resolution there is no official record, but on the evidence of the gentlemen above named it was renewed and officially recorded at the general meeting of November, 1846.—The meeting further resolved that the addition to Mr. Blyth's salary could not have effect beyond the 31st of December, 1846, by which time Mr. Blyth would have a claim on the Society of Rs. 3,200, payable on the completion of the promised letter-press.

On the 20th of May, 1847, the Secretaries received Mr. Blyth's letter-

press notes on the 64 plates, and these notes with the plates were immediately submitted to the "Zoological Section," appointed in February 1847, and composed of Capt. William Munro, J. W. Grant, Esq., R. W. G. Frith, Esq., and J. W. Laidlay, Esq. These gentlemen were requested to advise the Committee as to the mode of publication of the plates and MS. and as to the amount of remuneration due to Mr. Blyth.

The Zoological Section have formally reported their opinion, that the plates are "unworthy of publication under the auspices of the Society, being in many instances so rudely executed that it is scarcely possible to identify the animals they profess to represent, while in most others, whether regarded as works of science or of art, they fall far below that standard to which the Society's patronage should be extended;" regarding the amount of remuneration to Mr. Blyth, the "Zoological Section" observe that "while they regret that the funds of the Society should be expended so uselessly, they are unanimously of opinion that whatever the Society has promised should be fulfilled."

Fully adopting these views the Committee of Papers deem it necessary by republication of all the requisite documents, to enable the members of the Society to decide, 1st, as to the publication or suppression of the plates, and 2dly, as to the actual nature of the promise made to Mr. Blyth, the conditions under which that promise was accepted by Mr. Blyth—and the manner in which these conditions have been fulfilled on his part.

The Committee are of opinion that the plates should not be published, but that members desiring to be supplied with a set may have them on paying the cost of binding. While the Committee would not oppose the payment of Mr. Blyth's claim if made exclusively on the grounds of his general services to the Society during the period in question, they cannot on the other hand advise that a sum of 3,200 Rs. should be paid for the scanty and unsatisfactory MS. placed at their disposal after a period of four years from the time when Mr. Blyth was first instructed to edit Dr. Lord's manuscript. The questions above stated will be submitted to the decision of the resident members of the Society at the regular monthly meeting to be held on the 7th of July.

W. B. O'SHAUGHNESSY,

Asiatic Society, 15th June, 1847.

Sen. Secretary

REPORT OF THE ZOOLOGICAL SECTION WITH CORRESPONDENCE AND MINUTES OF MEMBERS.

Committee of Papers, Asiatic Society, 25th May, 1847.

The Senior Secretary begs leave to circulate a letter from the curator, Mr. Blyth, forwarding brief MS. notes on the "Burnes" drawings already lithographed, about one half of the series in the Society's possession.

The Society are pledged to pay Mr. Blyth the sum of 3,200 Rs. on his completion of letter-press for the drawings. The Senior Secretary, with reference to this obligation, proposes that Mr. B.'s MS. be referred to the Section of Zoology and Natural History, for their advice as to the mode of publication and the amount of payment to be awarded to Mr. Blyth.

To W. B. O'SHAUGHNESSY, Esq.

Senior Secretary of the Asiatic Society.

SIR,—I have the pleasure to forward you a series of the lithographs that have been executed of the late Sir Alexander Burnes' drawings of animals, with the letter-press to accompany their publication. It has not been possible to determine, in every instance, with certainty the precise species to which they refer, but I have spared no pains nor labour to arrive at the results embodied in my MS.

I have the honor to be, Sir,

Very obediently your's,

E. BLYTH.

As. So. Museum, May 20, 1847.

To Dr. W. B. O'SHAUGHNESSY,

Senior Secretary Asiatic Society.

SIR,—I have the honor to inform you that the "Burnes" Lithographs with Mr. Blyth's annotations, have been circulated to the members of the Section of Natural History for their opinion regarding the propriety of publishing the same, and the amount of remuneration due to Mr. Blyth.

2. You will see from the accompanying minutes that the Section has bestowed much attention upon the first of these points; and the members are unanimously of opinion that the drawings are unworthy of publication under the auspices of the Society, being in many instances so rudely executed that it is scarcely possible to identify the animals they profess to represent, while in most others, whether regarded as

works of science or of art, they fall far below that standard to which the Society's patronage should be extended.

3. As to the other question,—the amount of remuneration due to Mr. Blyth,—while they regret that the funds of the Society should be expended so uselessly, the members of the Section are equally unanimous in their opinion, that whatever the Society has promised should be fulfilled.

I am, Sir,

Your obedient Servant,

5th June, 1847.

J. W. LAIDLAY.

To Capt. MUNRO, J. W. GRANT, Esq. R. W. G. FRITH, Esq.
Members of the Zoological Section, Asiatic Society.

GENTLEMEN,—In compliance with the instructions of the Committee of Papers, I beg to circulate the accompanying portfolio of the "Burnes" Lithographs, and to solicit your opinions as to the mode of publication and the amount of remuneration due to Mr. Blyth for his annotations.

2. As to the former point, although these drawings are for the most part of very insignificant value for the purposes of science, and therefore not likely to extend the reputation of the Asiatic Society; yet if in your opinion publication be desirable, the cost of the letter-press, in addition to the very heavy expense already incurred for the drawings, would be very trifling, and even in the present embarrassed state of the Society's finances need not form any obstacle to the fulfilment of your wishes in that respect.

3. Regarding the second point; Mr. Blyth's remuneration was fixed by the Society at Co.'s Rs. 3,200, and it appears to me beyond our province to interfere in any way with its amount; although it rests with the Committee to determine whether the work required has been done or not.

I have the honor to be, Gentlemen,

Your obedient Servant,

Calcutta, 25th May, 1847.

J. W. LAIDLAY, *Secretary.*

I have carefully examined the accompanying portfolio of drawings and the MS. notes which are attached to each—I trust the Society will not in any way authorize the publication of these very bad and useless drawings, which can only entail ridicule on any scientific body giving them a place in their transactions. For instance, Plate 22 represents a Lark sitting in a tree. Plate 19 represents a Kingfisher with four toes in front of the foot instead of one behind and three very unequal ones in front.

With most of the Mammalia I am personally well acquainted and can confidently say that not one figure is even a fair representation of the animal.

intended, and nothing can be more ridiculous than the drawings of the Hyena, the white Weazle, the little *Alactaja* or *Jerboa*? so common about Ferozepore, and the Hogdeer. In the long legs and upturned spur it is difficult to recognise the superb Minal; and the graceful Coolon so common on the banks of the Ganges is most unjustly represented by a comparative short-legged bird in plate 28. Similar remarks might be applied to most of the drawings.

With regard to the remuneration to Mr. Blyth for his notes, I am not aware on what terms it was promised, but am of opinion that we should keep most faithfully all promises.

All that seems to have been done consists in guessing at the names of a number of animals, intended to be represented, in a series of bad drawings, with scarcely any original information regarding these animals. The little that has been done has been but slovenly executed, considering a large and distinct remuneration is expected. I will however particularize.

The name of Plate II. Fig. 3, can at best be but a guess, for the description of the animal does not at all agree with the account of its color, &c. as given in the 10th Volume of the *Annals and Mag. Nat. History*.—Plate IV. Fig. 2. has no trouble taken with it although it is supposed to be a new species.

Mr. B. wishes to make a new species from Plates VI. and VII. without assigning any reasons for doing so, except that *Sciuroptecis fimbriatus*, Gray, does not exceed 1½ ft. in length, whereas this squirrel is stated to be 2 ft. long. In a very recent work by Schinz on *Mammalia*, *S. fimbriatus*, under the name of *Pteromys fimbriatus*, is stated to be 1 ft. and 11 in. in length, leaving thus 1 inch difference, perhaps accidental in measuring, to cause the creation of a new species.

Plates VIII. and IX. are labelled with the same native names, as male and female, and no reason is given for assigning different names to the two. The Sikeen of the Himalayas is a very different looking animal from the one represented in Plate VIII. Mr. B., in his notes lays great stress on the presence of a beard, without stating that several other species closely allied have a beard as *Capra Egagrus*, Himalayana, *Falconeri*, and the Neilgherry Ibex. In a letter from Mr. Blyth read at a meeting of the Zoological Society on 10th August, 1841 he speaks of the Neilgherry Ibex “as having a considerable beard and thus differing from the Himalayan Ibex.” Schinz mentions the male of *Capra Himalayana*, Blyth, as being called Sikeen and the female Damnah. He also mentions *C. Falconeri* as being the Narkhor of Vigne and Lord. Some of these discrepancies might have been explained away, if Mr. B. had zealously undertaken an essay on the animals of Affghanistan and neighbouring countries.

There are also several other indications of haste and carelessness; thus

Gmelin not Pallas is the authority for *Capra Œgagrus*. *Grus* was not a genus, nor *Ardea cinerea*, a species of Linnaeus.

Dr. McClelland has already in the 2d volume of the *Calcutta Journal of Natural History* described several Affghan fishes from the late Dr. Griffith's collection, and to Dr. M'C. apparently Mr. Blyth is indebted for the short notes attached to this portion of the drawings.

The names of the snakes have been guessed at in a most hap-hazard way. Thus Pl. XLI. fig. 1, though bad enough to favour any guess is not an *Achrochordus*, but most probably *Boa Johnii*. (Russell, Plate 16) called by Schlegel *Portrya Eryx*. What possible reason can there be for supposing Plate XLII. fig. 2, to be the young of the one just referred to? Neither Plates XLIII. nor XLIV. fig. 4 are *Dipsas*, which is a genus of tree snakes only with large eyes and long, oval, or vertically contracted pupils. Plate XLVII. is most likely *Coluber anastomosatus*, Daudin.

With reference to a remark stated to have been made by Dr. Cantor approving of these lithographs, I am informed by that gentleman that the only two he had seen at the time he made the remark (1842) were two fishes, Plates XLVIII. and XLIX. which he thinks are good drawings.

WILLIAM MUNRO.

Fort William, May 28th, 1847.

I agree with Capt. Munro that these drawings are not worth publishing; the greater part of them are so bad that we might be pretty certain they never could be like the animals they are intended to represent, even if we had not the testimony of Captain Munro to the fact. As to the remuneration to be given for describing them, whatever has been promised must of course be fulfilled, but it is very annoying to see the funds of the Society expended so uselessly.

31st May, 1847.

J. W. GRANT.

I certainly cannot recommend the publication of such *trash* as these Burnes' drawings are. I believe there is little if any thing new amongst them, and if there be, it is almost impossible to identify their affinities, so wretchedly bad and incorrect are the figures. The fish are bad also, with fins and forms not belonging to them, and no attention paid to the number of rays in them. Consequently the difficulty Mr. Blyth has experienced in attempting to identify them has been very great, and I am sure much more could not have been done by him or any one else. Regarding the remuneration to Mr. Blyth, I am a witness to the fact of its having been promised to him, and I cannot for a moment understand how there can be the slightest question about its being granted to him. He is certainly entitled to it fully.

R. W. G. FRITH.

Statement of Disbursements on account of Sir A. Burnes' Drawings.

Jan. 3d. 1842, No. 1.—Paid Mr. J. Bennett for Lithographing Sir A. Burnes' drawings,	250	0	0
Feb. 14th, No. 9.—Mrs. Ballin for publishing Sir A. Burnes' drawings,	500	0	0
March.—Messrs. Rushton and Co. for paper on account of Sir A. Burnes' drawings,	48	6	6
April 2d, No. 23.—Messrs. W. Rushton and Co. for 3 Reams of best Royal Paper,	84	0	0
April 15th, No. 31.—Ditto for 6 Reams of Plate paper at 28 per Ream,	168	0	0
Less 8 per Cent. for 3 months,	3	5	9
	164	10	3
April 22d, No. 34.—Mr. Ballin on account of Sir A. Burnes' drawings being balance of Account,	132	10	0
April 25th, Nos. 37, 38.—Mr. J. Bennett on Account of Sir A. Burnes' drawings,	100	0	0
	431	4	3
June 29th, No. 58.—Mrs. Ballin as advance on account of Sir A. Burnes' drawings,	1000	0	
July 12th, No. 67.—Ditto ditto ditto ditto.	500	0	0
Aug. 3d, No. 77.—Messrs. W. Rushton and Co. for 6 Reams of drawing paper,	168	0	0
Aug. 23d, No. 84.—Mr. J. Bennett on account of Sir A. Burnes' drawings,	100	0	0
	268	0	0
Oct. 1st, No. 92.—Ditto on account of Lithographing Sir A. Burnes' drawings,	100	0	0
Dec. 1st, No. 113.—Ditto on account of Sir A. Burnes' drawings,	100	0	0
Dec. 5th, No. 129.—Messrs. W. Rushton and Co. for 6 Reams of Plate paper,	168	0	0
April 27th, No. 39.—Do. for $\frac{1}{2}$ Ream of fine foolscap,	4	0	0
$\frac{3}{4}$ Do. of Letter paper,	4	0	0
1 Dozen blacklead Pencils,	3	0	0
	10	0	0
Dec. 19th, No. 123.—Mrs. Ballin for 500 Receipts including paper,	12	8	0
	3,438	2	9
Deduct amount of the last two bills being not on account of Burnes drawings,	22	8	0
	3415	10	9
	5	T	

Jan. 11th, 1843, No. 131.—Mr. J. Bennett on account of Burnes' drawings,	100	0	0
April 18th, No. 166.—Messrs. W. Rushton and Co. for 2 Reams 3 Quires and 6 sheets of Plate paper,	60	8	9
No. 170.—Mr. J. Bennett on account of Sir A. Burnes' drawings,	100	0	0
April 23d, No. 173.—Bissonath Banerjee for 1 Ream of drawing paper on account of Sir A. Burnes' drawings,	25	0	0
May 5th, No. 176.—Ditto for 2 Reams of drawing paper for Sir A. Burnes' drawings,	45	0	0
June 23d, No. 196.—Ditto for 1 Ream of ditto ditto ditto.....	22	8	0
No. 196½.—Ditto for 2 Reams of ditto ditto ditto	50	0	0
July, No. 202.—Ditto for 1 Ream of ditto ditto ditto.....	22	8	0
	425	8	9
Deduct Discount on Bill No. 173 erroneously charged,	2	8	0
			423 0 9
Feb. 6th, 1844, No. 337.—Paid Mr. J. Bennett amount being the balance on account of Sir A. Burnes' drawings,	18	0	0
			18 0 0
Dec. 17th, 1845, No. 687.—Paid Mrs. Ballin amount being balance on account of Sir A. Burnes' drawings,.....	68	4	0
			68 4 0
Jan. 29th, 1846, No. 707.—Paid Mrs. Ballin for Lithographing and Colouring as per Bill,	261	6	0
July 21st, No. 815—Ditto for Printing and Colouring as per Bill,	261	6	0
Sept. 12th, No. 838.—* Ditto for ditto.....	348	0	0
			870 12 0
Jan. 18th, 1847, No. 8.—Paid* Mrs. Ballin for Printing and Colouring as per Bill,	519	11	0
			519 11 0
	Co.'s Rupees,..	5,315	6 0
May, 19th.—Paid* Mrs. Ballin for Printing and Colouring as per Bill,.....		482	4
	Co.'s Rupees,..	5797	10

Calcutta, Asiatic Society, the 20th March, 1847.

* All these payments have been made for work ordered and in progress previous to the resolution of the Committee to discontinue all expenditure on this account.—SECRETARY'S NOTE.

The above circular and reports having been read, and the subject commented upon in detail by Sir J. P. Grant, Col. Forbes, Mr. W. P. Grant, Mr. Welby Jackson, Mr. Blyth, Capt. Munro, and Dr. W. B. O'Shaughnessy, it was unanimously decided :—

1.—That the plates be not published, but that copies be supplied to any member applying for them.

2.—That Mr. Blyth's claim be paid in full in consideration of his general services to the Society during the period concerned, and without reference to his MS. for the Burnes' drawings.

3.—That the Senior Secretary be authorized to sell off Company's Paper to pay Mr. Blyth's demand.

The Committee of Papers having received a communication from Mr. Piddington, with a postscript by Mr. Torrens, regarding the expenses incurred by the lithographing of the Chusan Zoological drawings by Dr. Cantor, the Senior Secretary was proceeding, by direction of the Committee, to read Mr. Piddington's letter when that gentleman objected to its being brought forward. The subjoined Report by the Committee was then read :—

The Committee of Papers beg leave to submit to the Society a communication from Mr. Piddington, dated the 19th June, from which, they have been for the first time led to infer that a portion of the outlay on account of the "Cantor drawings," viz. Co.'s Rs. 2,300, might have been in *advances* for future work, and not solely for the 12 plates finished by Mr. Bennett, up to July 1846.

After repeated applications to Mr. Bennett, the Committee have at length ascertained that Mr. Bennett undertook to execute coloured plates of the whole of Dr. Cantor's drawings for the sum of Rupees 4,174. All expenses included.

The original drawings form a portfolio (bound) of 88 pages of sketches, which could be conveniently lithographed in 61 4to. plates.

Of the 88 pages, 13, containing the subjects for 12 plates, were delivered to Mr. Bennett and lithographed and coloured by him, being one-fifth of the number of plates he agreed to complete for Rs. 4,174.

Advances were made to Mr. Bennett (see account) during the progress of these 12 plates, to the amount of Rs. 2,300; of these advances 1,700 Rs. were paid on the order of Mr. Piddington, countersigned by Mr. Torrens, between the 9th June 1844, and 23rd December 1845, and Rs. 600, on the order of Mr. Torrens alone from 20th April 1846, to 26th October 1846. Total Rs. 2,300.

Mr. Bennett's actual charge for the 12 plates completed during that time is Rs. 785. No more of the original drawings having been delivered to Mr. Bennett, he is accordingly indebted to the Society, on this account, to the amount of Rs. 1,515.

In answer to an application on the part of the Committee of Papers, Mr. Bennett has consented to proceed with the "Cantor drawings" or other drawings, not involving greater labour or expense, so as to adjust the balance now against him in the Society's accounts. The Committee accordingly propose to issue the plates now in hand with early numbers of the Journal, as may be found convenient, as letter press must accompany them, and to proceed with others to the extent of the sum specified as advanced by the Society on this account.

(By order of the Committee,)

W. B. O'SHAUGHNESSY.

Asiatic Society, 5th July, 1847.

The report having been read it was unanimously agreed to authorize the Secretaries to take the best means in their power to secure work being done by Mr. Bennett in illustrations of the Journal to the extent of the advance he had received.

Mr. Piddington brought to the notice of the meeting that the tomb of Sir Wm. Jones is in a dilapidated state, and submitted an estimate by Messrs. Weaver and Co. for the repairs thereof, amounting to Rs. 386 10. Resolved that the estimate be referred to Col. Forbes for examination and report and that the expense of the repairs be defrayed by a subscription among the members of the Society.

Books received for the Meeting of the 7th June, 1847.

PRESENTED.

Proceedings of the Academy of Natural Sciences of Philadelphia, Nos. 4 and 5.—BY THE ACADEMY.

A cheap, simple, and concise method of obtaining early warning of any approach to Spontaneous Combustion or Ignition by Accident, on board of Steamers, Coal or other Ships, and of instantly conveying water nearly to the spot; with some chemical notes and practical deductions for the use of sailors, by H. Piddington, Esq.—BY THE AUTHOR.

Le Moniteur des Indes Orientales et Occidentales, No. 12.—BY THE EDITORS.

On the Relation of Islam to the Gospel, translated from the German of Dr. J. A. Mochler, by the Rev. J. P. Menge. (2 copies.)—BY J. MUIR, ESQ.

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the month of June, 1847.—FROM THE SURVEYOR GENERAL'S OFFICE.

The Oriental Christian Spectator, Nos. 3 to 6.—BY THE EDITOR.

The Calcutta Christian Observer, for June and July, 1847.—BY THE EDITORS.

EXCHANGED.

Journal Asiatique, No. 40.

The Athenæum, 13 Nos. for 1847.

The Edinburgh New Philosophical Journal, No. 84.

The London, Edinburgh, and Dublin Philosophical Magazine, No. 201.

PURCHASED.

The Annals and Magazine of Natural History, Nos. 125 and 126.

The Edinburgh Review, No. 172.

Journal des Savans, for January, February and March, 1847.

The Calcutta Review, No. 14.

The North British Review, No. 12.

Owing to the lateness of the hour the Curators' Reports were not received.* The thanks of the Society were voted as usual to the donors of books and papers, and of contributions to the Museum.

Report of Curator, Zoological Department.

The following are the donations to which I have, upon this occasion, to call the attention of the Society.

1. From W. C. Thorburn, Esq. of Goalpara, I have received a collection birds, reptiles, fishes, and crustacea, which has added a few species to the Museum, as the *Emys dhonghoka*, Gray and Hardwicke, and some small fishes described by Buchanan Hamilton.

2. Mr. J. Weaver has favored us with a small collection of sundries, chiefly from the Sandheads; comprising a small fish allied to *Equula* (which I have not yet identified), two human fetuses, some sea Snakes, &c.

3. Mr. J. Reeve has sent a small Crocodile, $5\frac{1}{4}$ feet long, of the species *Crocodilus palustris*, Lesson.

4. E. B. Ryan, Esq. A stuffed specimen of a Leopard.

5. J. C. Pépé, Esq. of Gurruckpore. A Boar skull, from the Nepal Terai, of the species or variety having a broad occiput, noticed in XV, 135.

6. Mr. E. Lindstedt. A Porenpine (*Hystrix*), of the common small species inhabiting the Sunderbuns.

7. Mr. Nathan Buckley. A specimen of a *Limulus*, or 'King Crab,' one of two species common at the mouth of the river. The present one is distinguished (among other characters) by having a cylindrical tail: and one sex only of the other corresponds to the definition of *Tachypleus*, Leach.

8. Mr. C. J. Madge. A living Bat, of the species *Megaderma lyra*. This Bat, which is the *M. carnatica* of Mr. Elliot, seems to be very generally diffused throughout India, being replaced in the Malay countries by *M.*

* Mr. Blyth's MS. of his report received subsequently to the meeting is now inserted.

spasma (also in the Muscum), and further east by the newly described *M. philippinensis*, Waterhouse, *P. Z. S.* 1843, p. 69; while in Africa it is represented by the *M. frons*.

9. Capt. Phayre, of Moulmein. A young living specimen of a Binturong—*Arctictis binturong*, (Raffles,) *v. Ictides ater*, Valenciennes. This little animal is very tame and playful, having most of the actions of a kitten, combined with a few Ursine traits; it also mews very like a young kitten when impatient of being left alone; and if gratified by being noticed, it purrs, like the *Felidæ* and many *Viverridæ* (as the *Paradoxuri*). The prehensile power of the tail is very great, and exists throughout that organ; by the extremity alone it will readily support its weight. By means of the limbs, also, it has great power of clinging, so as not to be easily dislodged when it has grasped a person by the leg, as it is rather fond of doing when suffered to run loose: indeed, though it bites only in play, its deciduary canines are so sharp that its fondness for grasping one's limbs is rather troublesome. Although its eyes, with the pupil contracted to the narrowest line during the day, indicate the naturally nocturnal habitude of the species, this animal is lively and always ready to play and frisk with any one, at all times of the day: the iris is of a light hazel colour. Mr. McClelland had a larger Binturong some time ago, from Assam, which was allowed its liberty, and passed its time chiefly upon a tree near his house; from which, instead of descending the trunk when it wanted to come down, it would sometimes drop from a height of several feet, as is the habit of the Coatimoudis (*Nasua*) of S. America, which, with the Binturong, belong to the group of true *Plantigrada*. Indeed, I think the Racoons (*Procyon*) have the same habit, another genus pertaining to the same division.

10. From the Rev. J. Mason, of Mergui. Specimens of *Calotes versicolor*, and of *Hemidactylus Coctæi*, from the neighbourhood of Moulmein, and therefore valuable from the locality,—both reptiles being common in Calcutta. Also an imperfect skin of *Pomatorhinus olivaceus*, nobis, p. 451 ante; differing from the specimen previously described in having the crown of a more dusky olive than the back, though not slaty as in *P. schisticeps*.

11. From Capt. Thos. Hutton, of Mussoorie. A few bird-skins, among which is one species new to the Museum, viz. *Certhia himalayana*, Vigors, *v. asiatica*, Swainson; "common in the Deyra Doou." This is quite distinct from *C. nipalensis*, Hodgson, and from my *C. discolor*, inhabiting Sikim; making three Himalayan species of typical *Certhia*. The *C. spilonota*, Franklin, has been at length obtained by Mr. Hodgson from Behar, and is described as a new generic form, by the name *Salpornis*, by Mr. G. R. Gray, *Ann. Mag. N. H.* (May) 1847, p. 352; and with it Mr. Gray describes, as a new genus and species, a *Caulodromus Gracei*, which is my *Rimator malacoptilus*, p. 155 ante (February 1847), founded on the identical specimen, which was lent me for the purpose of being described by Mr. Grace, and so labelled by me when I returned it.

12. C. J. Bonnevie, Esq. of Rungpore. The limb-bones of a large Tiger.
July 7th, 1847. E. BLYTH.

The following Supplementary Report refers to the Society's present collection of *Sciuridæ*, which was exhibited at the Meeting.

Supplementary Report by the Curator, Zoological Department.

The fine series of animals which I have now the pleasure to exhibit, illustrative of the great Squirrel family—*Sciuridæ*, comprises representatives of its three principal subordinate groups of Flying Squirrels, Ordinary Squirrels, and Marmots.

Of the first, we possess 23 (select) mounted specimens, pertaining to the divisions *Pteromys*, Cuv., as at present restricted, and *Sciuropterus*, F. Cuvier.

The species of restricted *Pteromys* are by no means satisfactorily determined; and I can only contribute a little towards their elucidation. The Society's specimens are as follow:—

1. *Pt. petaurista*, (Pallas): *Taguan* of Buffon, from Malabar; *Pt. oral*, Tickell, *Calc. Journ. N. H.* II, 401: *Pt. philippensis*, Gray, apud Elliot, *Madr. Journ.* No. XXV, 217. This is the only large Flying Squirrel of the peninsula of India, and probably of Ceylon;* that of the Moluccas and Philippine Islands can hardly be the same. In all the specimens I have seen (excepting a pale variety to be noticed afterwards), the terminal two-thirds or three-fourths of the tail were black or blackish, with rarely a little white at the extreme tip. Upper-parts dusky maronne-black, grizzled with whitish tips to the fur, terminating in inconspicuous black points: membrane and limbs above, much brighter and more rufous maronne: feet, muzzle, and around the eyes, black: and the under-parts are dingy brownish-grey. An individual variety, procured in Travancore by Lord Arthur Hay, is much paler than usual, being of a light maronne-brown above with yellowish-white tips; the long hair behind the ears is pale rufous, instead of being dark; the fore and hind feet only are, in part, blackish, especially the former; the muzzle and around the eyes are dark brown; and the tail has its terminal three-fifths uniform rufous-brown, a little darker at the tip, while its base is paler with minutely mingled whitish hairs: under-parts with scanty annulated hairs, of a predominant pale colour; and two white streaks extend longitudinally along the rows of mammæ. Of this Indian species, I have retained for the Museum a very fine specimen, from Travancore, presented by Lord Arthur Hay; and an example of the young, brought alive to Midnapore probably from the Cuttack jungles, and presented (dead) by Mr. P. Homfrey.

2. *Pt. petaurista* (?), var. *cineraceus*, nobis. The common large species of Arracan and the Tenasserim provinces, and the only large kind I have seen from that range of territory. Very like the preceding, but the whitish tips to the fur more predominating, imparting a hoary-grey appearance to the whole upper surface, and continued along the tail, the extreme tip only of which is blackish; under-parts pure white, or nearly so, in different specimens; and the rest of the colouring much as in the preceding variety (?) In both, the white tips to the fur predominate in the newly put forth pelage, and disappear to a great extent as the fur becomes old and worn. In the young of the Arracan race, the black extreme points of the fur are much developed. We have two adults, and a small young specimen, from Arracan, presented by Capt. Phayre; and another adult, in worn pelage, and unusually rufescent with darker tail than ordinary, from Tenasserim, presented by the Rev. J. Barbe.

A third dark race, or species, of a bay-brown-colour above, variegated with white *splashes*, was procured at Malacca by Capt. Charleton, and has been described as *Pt. punctatus* by Mr. Gray, *Ann. Mag. N. H.* 1846, p. 211.† It is perhaps identical with *Pt. elegans* of Dr. S. Muller, from Java.

3. *Pteromys albiventer*, Gray, *Hardw. Ill. Ind. Zool.*: placed as a synonyme of the Malayan *Pt. nitidus* by Dr. Cantor, *J. A S.* XV, 252; six speci-

* A notice of the habits of the *Pteromys* of that island is given in Major Forbes's "Journal of a Residence of 11 years in Ceylon."

† *Felis Charltoni*, Gray, described on the same occasion, is merely an occasional variety of *F. bengalensis*. Major Jenkins favored the Society with a living specimen of this variety from Assam, and with two live specimens of the ordinary marking, all of which are now set up in the Museum. We have also an intermediate variety, which removes all doubt of the specific identity.

mens, however, assigned to Nepal, are enumerated in Mr. Gray's Catalogue of the mammalia in the British Museum. A very fine example, procured (or the skin purchased) at Simla by Capt. Thomas, 39th Regt. B. N. I, and by him presented to the Society. This is perhaps an excessively stretched skin of *Pt. magnificus*; but, in new pelage, the white tips to the fur are very little developed, and there is no pale colour upon the shoulders, nor on the sides and membrane above: under-parts throughout rufescent-white. Tail tipped with black as in *Pt. magnificus*, which is not represented in Hardwicke's figure of *Pt. albiventer*, though the tail of the latter is so short that it looks as if it had been mutilated of its black tip, as was doubtless the case with the original.*

4. *Pt. magnificus*, (Hodgson,) *J. A. S. V.*, 231. Specimen from Nepal, purchased of a Bhoota. Inhabits also the hill ranges of Assam, from whence Major Jenkins has favoured the Society with (imperfect) skins, entirely resembling those from the Himalaya proper.

5. *Pt. nobilis*, (Gray,) *Ann. Mag. N. H.* 1842, p. 263: *Sciuropterus chrysotrix*, Hodgson, *J. A. S. XIII.*, 67. Very fine specimen, with the pale dorsal streak complete, presented by Willis Earle, Esq.; another, with dorsal streak between the shoulders only, and merely a slight trace over the croup, presented by Dr. Campbell; both from Darjeeling: a third, without a trace of dorsal streak, purchased of a Bhoota. Neither of these has any whitish tips to the fur, as in *Pt. magnificus*; but, in all other respects, the last especially approximates *Pt. magnificus* so very closely, that I cannot but doubt its distinctness as a species.

6. *Pt. nitidus*, Cuvier. Adult and young, from Malacca, presented by the Rev. F. J. Lindstedt. Hab. also Java, Sumatra, and Borneo, apud Schinz.

The remaining species, with shorter and distichous tail, appertain to the division *Sciuropterus*, F. Cuv.; and all of them are well defined as species.

7. *Sciuropterus caniceps*, Gray, *Ann. Mag. N. H.*, X, 262: *Pteromys senex*, Hodgson, *J. A. S. XIII.*, 68. Two specimens from Darjeeling: one presented by the lady of W. H. Oakes, Esq. C. S.; the other procured by exchange.

8. *Sc. fimbriatus*, Gray, *M. N. H. n. s.*, Vol. I, p. 84. Two specimens: one from Simla, presented by L. C. Stewart, Esq., now of H. M. 29th Regt.; the other in the Museum when I took charge of it. Inhabits the N. W. Himalaya. The colour of the upper-parts of this species resembles that of an English wild Rabbit.

N. B. A species seemingly allied to *Sc. fimbriatus*, but one-fourth larger, was figured by Sir A. Burnes as the *Mooshi baldar* of the mountain districts of Nijrow, and identified by him as the "Flying Fox" of the translation of Baber's memoirs (p. 145). A length of 2ft. is assigned to it; whereas I doubt (from examination of several specimens) if *Sc. fimbriatus* would ever exceed 19in. at the most. The colour of the upper-parts is represented as pale fulvescent ashy-brown, darker on the limbs; tail broad and bushy, and tipped with blackish: under-parts dull white, with a ferruginous margin to the membrane underneath. If verified, it might rank as *Sc. Baberi*, nobis.

9. *Sc. albioniger*, Hodgson, *J. A. S. V.*, 231: *Sc. Turnbullii*, Gray, *P. Z. S.* 1837, p. 68; *M. N. H. n. s.* I, 68. Inhabits Nepal, Sikim, Bootan: common at Darjeeling. Three specimens, presented by C. S. Bonnevie, Esq., Mrs. Saxon, and J. Shave, Esq.

10. *Sc. villosus*, nobis, *n. s.*: referred to *Sc. sagitta* in Mr. Walker's Catalogue of Assamese mammalia, *Calc. Journ. N. H.* III, 266. Two speci-

* The *Pt. melanotis*, Gray, *M. N. H.*, n. s. I, 584, and originally assigned to Nepal, is referred to Java in Mr. Gray's subsequent catalogue of the British Museum collection of mammalia, and there identified with *Pt. Daurin*, Tem., and with the *Pt. nitidus* apud Gray of Hardwicke's 'Illustrations.'



SCIUROPTERUS spadiceus, p. 807 Fig. 2 SCIURUS macrotarsus, p. 809 Fig. 3. SCBarbae, p. 873 Relative size

T. Bland & Son, Litho. Printers (Ld.).



meus, presented by Mr. F. Bonynge, who procured them during his stay in Upper Assam; and as the same gentleman gave one to Mr. Walker at the time of that naturalist's visit to his station in 1842, there can be no doubt of the identity of the species with that referred to *sagitta* by Mr. Walker. This animal presents a still nearer approach than does the last to the Malayan *Sc. Horsfieldii*, Waterhouse, *P. Z. S.* 1837, p. 87 (vel *Pteromys aurantiacus*, Wagner); but the tuft of long fine hair surrounding the ears readily distinguishes it,* also the smaller and clad ears, the brushes of hair impending the claws more especially of the hind-feet, and the last are much more densely covered with hair: the fur of the upper-parts is besides less fine, and more grizzled; and the blackish (or it might be termed black) base of the fur is more apparent on that of the lateral membrane; in *Sc. Horsfieldii* the fur is not blackish at base, but of a dusky-grey colour. Of the same size and form as *Sc. Horsfieldii* and *Sc. alboniger*, the present species is further distinguished from the latter by the bright ferruginous colour, with some pale tips intermingled, of its general upper surface; by its strongly rufescent tail, pale towards the base, and the deep ferruginous tinge of the fur of the under surface of its lateral membranes, which also more or less imbues the entire under surface of the body. Length (of a large specimen) 16 inches, of which the tail measures half; of the ear posteriorly $\frac{5}{8}$ inch; and tarse to end of claws $1\frac{1}{2}$ inch. Mr. Bonynge favored me with an interesting notice of the crepuscular habits of this little animal, in common with the rest of its tribe; and which recalled to mind Catesby's account of the little Flying Squirrel of the United States (*Sc. volucella*), by the remarks that—"in the dusk of the evening, when making their downward" (*i. e.* gradually descending) "leap, they look more like falling leaves than anything else." He adds—"They are very difficult to be got, though plentiful enough. Whenever the Singphos can catch and kill them, they do so."

(*Sc. fuscicapillus*, Jerdon. This is an undescribed species, from S. India, a notice of which may be introduced here. Length $7\frac{1}{2}$ inch., of tail (vertebræ) 6 inch., the hair reaching $\frac{3}{4}$ inch further: fore-foot proportionally large, measuring with claws $1\frac{1}{2}$ inch: hind-feet wanting in the only specimen examined. Ears small, and almost wholly naked, of an ovate form, and measuring $\frac{1}{2}$ inch long posteriorly. Tail very bushy, and but indistinctly distichous. Moustaches long and black. Fur rather long (the hairs measuring fully $\frac{3}{4}$ inch on the back), porrect, of extremely fine texture, the individual piles sinuous, and those of the upper-parts fuscous to near the tips, which are of a rufescent-fulvous hue, or dark brownish-isabelline, forming the surface colour; on the croup the fur is shorter and more dense, somewhat as in *Sc. genibarbis*, (Horsf.); and upon the head it is much shorter, and the basal dusky hue predominates over the greyish-brown tips: above the volar membrane also the blackish hue is chiefly apparent. Under-parts rufous-white, extending to the cheeks and under-lip; the lateral fur margining the membrane rufo-fulvous. The hairs of the tail measure 1 inch and upwards, for its basal half or more, becoming gradually rather shorter towards the tip; their colour pale at base, then darker, producing an *ensemble* nearly of the colour of the back; but underneath, the tail is fuscous or blackish-brown, and the extreme tip is whitish.

11. *Sc. spadiceus*, nobis, *n. s.* pl. XXXVI, fig. 1. A diminutive species from Arracan, about 5 inch. in length, minus the tail, which measures $4\frac{1}{2}$ inch.; tarse to end of claws $1\frac{1}{2}$ inch. Upper surface bright ferruginous-bay in old specimens, with the membranes, limbs, and tail, dusky, and the basal fourth of the latter pale rufous underneath: under-parts dull white, with fur of a somewhat

* In *Sc. genibarbis*, Horsfield, the tuft below the ear is more marked and circumscribed.

woolly texture: that of the upper-parts dusky except at tip. Three specimens, presented by Capt. Phayre.

Zoologists who profess the opinion that nearly allied races of animals, respectively inhabiting different localities, and presenting constant differences of colouring and other trivial distinctive characters, should be set down as permanent local varieties of the same rather than as distinct allied species,—leaving it quite optional, however, which should be considered a species and which a variety,—and who, with M. M. Temminck and Schlegel, thus regard the Indian *Sciurus purpureus* as a permanent local variety of *Sc. bicolor*, or rather both as races of the same *Sc. maximus*, might well incline to reduce the whole series of restricted *Pteromydes* to the rank of varieties only of a single widely distributed species, however true they may be and are to their distinctions of colouring, and although two such marked races as *Pt. nitidus* and *Pt. punctatus* inhabit together in the Malayan peninsula—both occurring in the vicinity of Malacca. But be this as it may, such various permanent races require discrimination: and the analogy of the *Sciuropteri* inhabiting the same countries, which are well distinguished apart by good specific characters, and are even more numerous than the *Pteromydes*, would point to the conclusion that the latter are alike distinct and independent of each other, at least in the generality of cases, however closely they may resemble; and that theories on the geographical range of particular species, founded on the alleged specific identity of what can only be presumed to be varieties of the same, rest upon a very insecure and disputable foundation. I add a summary of the distribution of the Indian Flying Squirrels, with those of the eastern coast of the Bay of Bengal, as far southward as the Straits of Malacca.—Those of Ceylon remain to be identified. In the Indian peninsula generally, from the jungles of central India to Travancore, there have only been observed the *Pteromys petaurista*, and *Sciuropterus fuscocapillus* lately discovered (I believe in the Nilgherries). In the Himalaya, *Pteromys albiventer*, *Pt. magnificus*, and *Pt. nobilis*, would seem to appear successively, as we proceed from the N. W. to the S. E.; and *Sc. Baberi* (?), *Sc. fimbriatus*, *Sc. alboniger*, and *Sc. caniceps*, present apparently a similar succession,—the two latter alone certainly occurring together, in Sikim. In the Assam ranges, *Pt. magnificus* re-appears, which would argue its existence in the intervening country; and, indeed, it remains to ascertain whether *Pt. albiventer* and *Pt. nobilis* are really different from *Pt. magnificus*. *Sc. villosus* has been observed hitherto only in Assam. One or two species are found in Sylhet that I have not yet seen. In Arracan, there appear to be only the *Pt. petaurista* (?), var. *cineraceus*, which extends southward to the Tenasserim provinces, and the diminutive *Sc. spadiceus*. Lastly, the Malayan peninsula yields *Pt. nitidus* and *Pt. punctatus*, and *Sc. Horsfieldii* and *Sc. genibarbis*. From the great eastern archipelago the Society does not possess a single specimen.

Of the ordinary Squirrels (*Sciurus*), we may commence with a group of large species, or (more or less ?) permanent races, peculiar to S. E. Asia and its islands; the whole of which are but local varieties of a single species, in the opinion of some zoologists.

1. *Sc. purpureus*, Zimmerman: *Sc. maximus* (in part), Schreber; *Sc. bombayensis*, Boddart; *Sc. indicus*, Erxleben; *Sc. Elphinstonii*, Sykes. These synonyms, copied from Mr. Gray, and to which may be added *Sc. malabaricus*, Schinz, I believe to be correctly assigned to the common great Squirrel peculiar to the peninsula of India. So far as I have seen, it varies chiefly in the development of the black on the shoulders and fore-limbs, and that of the croup and thighs, which last is very commonly wanting, the former rarely more than reduced; the tail also has more or less black on

maronne-red above, with usually (if not always) a pale tip; the under-parts are more or less deep-coloured; and the relative proportion of the colours of the head is subject to variation, its dark portion being generally maronne when little developed, blackish when more extended: the line proceeding downward from the front of the ear is of very constant (if not invariable) occurrence; and may be presumed to exist in the black variety mentioned by Mr. Elliot (*Madras Journ.* X, 217), distinguishing it from the black race so common in the countries eastward of the Bay of Bengal. The great development of the fur upon the ear seems always to characterize this Indian race or species, and in a less degree the Himalayan and Assamese specimens of our No. 3; while in Arracan, Tenasserim, and Malayan specimens of the latter, and in the Cinghalese and Javan races, the ears are clad with very short hairs, as in the generality of Indian and Malayan *Sciuri*.* I have retained three specimens for the Museum of *Sc. purpureus*, all set up while fresh by the Society's taxidermists.

2. *Sc. macrourus*. Forster (see Say): also *White-legged Squirrel*, Pennant, 'Quadrupeds,' II, 407; and *Sc. ceylonensis*, Boddaert. Pl. XXXVI, fig. 2. Mr. Gray refers this name to a Javanese race or species; and certainly Dr. Horsfield's figure assigned by him to *Sc. bicolor*, in the 'Zoological Researches in Java,' approximates the Ceylon animal considerably. In general, it has been placed as a synonyme of the preceding species; but the race has at least as good a claim to rank separately, as have either of the two next. The ears are clad with short hair, instead of being densely tufted: and the colouring is remarkably different. The Ceylon specimen figured (presented by Dr. R. Templeton, of Colombo,) measures about 2ft. long, of which the tail is half, its hair reaching 1½ in. further. Colour of the upper-parts dull maronne-black, much grizzled with whitish tips on the sides, croup, and hanches, and slightly on the back and shoulders; the croup having numerous buffy-white hairs intermixed: basal three-fifths of the tail black, with long white tips to the hairs, and a white median line underneath (or behind); the rest or terminal portion brown with less conspicuously developed white tips, except at the end, where these gradually disappear: cheeks, under-parts, and limbs, almost pure white, with a slight fulvescent tinge; but there is an abruptly defined blackish patch on the upper portion of the fore-limbs externally, passing upward to the shoulder, a corresponding grizzled patch on the hind-limbs continuous with the colouring of the croup and hanches, and the toes of all the feet are blackish: there is also a blackish patch on the crown of the head, and a few blackish hairs on the white cheeks; a dull whitish occipital band behind the ears; and the short fur upon the outside of the ears is whitish, excepting a slight black pencil anteriorly.—The only other specimen I have seen was procured in Travancore, and sent to me on loan by Walter Elliot, Esq.; and I took of it a minute description, which I here subjoin.†

* Upon the whole, the variation I have observed in different individuals of this race, from distantly separated localities, is, after all, but trifling, and does not appear to be influenced by locality.

† Length about 21 inches, of which the tail measured 9 inches, or with its hair 10 inches. Fur of the upper-parts coarse and rigid at tip, a little waved, or not lying even and smooth; the basal two-thirds fine and soft, of an umbré-brown colour, as is also the first portion of the thicker extremity; the tips being of a pale straw-colour, imparting a grizzled appearance: crown of the head, and base of the anterior limbs, darker; rest of the head, with the occiput, throat, breast, and the four limbs, pale isabella-brown, or dirty straw-colour, the hair along each side of the belly conspicuously longer (as likewise in the Ceylon specimen); that of the under-parts, and beneath the fore-limbs, short and much frizzled, and tinged with ferruginous: the toes of all the feet are blackish-brown above. tail coloured like the back at base, the brown colour predominating

3. *Sc. bicolor*, Sparrman, apud Horsfield, *Proc. Zool. Soc.* 1839, p. 151; also apud Schinz, and Cantor, *J. A. S.* XV, 246: *Sc. affinis*, Raffles (the pale variety, which is also *Sc. aureiventris*, Is. Geoffroy); *Sc. giganteus*, McClelland, described in *P. Z. S. loc. cit.*; *Sc. macrouroides*, Hodgson, enumerated (not described) as new in *J. A. S.* X, 915 (1841). That Sparrman's brief Latin diagnosis applies very well to the present race or species is undeniable; but as it was founded on a Javanese specimen, and there would appear to be some doubt whether the race under consideration inhabits Java, Mr. Gray refers the name *bicolor* to another and well known Javanese race, placing it as a synonyme of *Sc. javensis*, Schreber; while for the animal here treated of, he adopts the name *macrouroides*, Hodgson, which yields precedence to *giganteus* of McClelland, as applied to the same dark variety of the race. Regarding, however, (with Dr. Cantor,) the pale variety common in the Malayau peninsula as, without doubt, specifically the same as the ordinary dark variety, the rejection of the name *bicolor* for this race would render it necessary to adopt the name *affinis*, Raffles, for the normally coloured or dark variety as well as for the pale variety, and notwithstanding that Raffles alludes to the former by the name *Sc. maximus*, under which Schreber comprehends what are here provisionally regarded as different species of these great Squirrels. But it remains to ascertain, upon sufficient authority, whether it be true that the present race does not inhabit Java. Schinz, who describes it correctly, gives Java, Sumatra, Borneo, and Ceylon, as habitats—the last named locality doubtless following from his mis-identification of *Sc. macrourus* of Ceylon with the race under review. In the Malayan peninsula it abounds (and there alone it would seem that the pale variety occurs); also, proceeding northward, in Tenasserim, Arracan, Sylhet, Munneepore, and Assam, as well as in the S. E. Himalaya, as especially about Darjeeling. In specimens from all this range of territory, the dark variety exhibits no variation worth mentioning, (certainly no local variation,) except that the ears of Himalayan and Assamese specimens are pretty densely tufted (though less so than in *Sc. purpureus*), while this is not the case with those from Arracan, Tenasserim, and the Malayan peninsula. In adults, the upper-parts seem to be always deep black in the new pelage, becoming bleached and oftentimes very rusty as the fur gets old, especially upon the back towards the croup; and this faded fur may be commonly seen to be succeeded by deep black fur in specimens that were changing their coat. The young would seem to be always thus rusty above, and when small are very pale about the croup. The under-parts are more or less deep-coloured in different individuals. A black band on the cheek, descending backward from before the eye, is of very regular occurrence; and above this, the yellowish-white colour is more or less continued forward; the sides of the upper lip are sometimes black, sometimes white, or with black and white hairs intermixed. The following specimens have been retained for the Museum. One from Darjeeling, presented by the late Mr. Webb of that place; one from Arracan (with some pale hairs intermixed along the tail), presented alive by Capt. J. R. Abbott; one from Amherst (remarkably fine), presented by E. O'Riley, Esq.; another, from Mergui, presented by the Rev. J. Barbe; and one from Malacca, by the Rev. F. J. Lindstedt. Also two specimens of the pale variety, from Malacca, presented by Mr. Frith and Mr. E. Lindstedt.

4. *Sc. javensis*, Schreber, var.—Mr. Gray, in his catalogue of the mammalia in the British Museum, still admits three Javanese races of these large Squirrels, as distinct: adopting the name *hypoleucos*, Horsfield, for one of about the middle, and whitish at the end.—This description does not exactly tally with the Ceylon specimen; but the species is the same, beyond all question, and the general similarity of the two specimens is considerable.

them, and *macrourus*, Forster, for another : but the latter, as we have seen, must be reserved for the Cinghalese race ; and the former was subsequently considered by Dr. Horsfield as "a mere variety of *Sc. Leschenaultii*," (i. e. *javensis*). A single specimen in the Society's collection, presented by the Batavian Society, is of a uniform fuscous-brown above and along the upper surface of the tail ; the sides rather paler and obscurely grizzled with a lighter hue ; the anterior part of the head whitish, passing off gradually in whitish tips on the crown : shoulders more distinctly grizzled ; and the entire under-parts and limbs externally sullied white, inclusive of the anterior portion of the outside of the thigh ; ears pale and rusty, as are also the cheeks and sides of the neck ; and the tail underneath is whitish throughout its length, bordered externally (i. e. the hairs tipped) with the hue of the upper-parts : whiskers long and black. The structure is absolutely as in the preceding race.

5. *Sc. Rafflesii*, Vigors : *Sc. Prevostii*, Desm., apud Schinz : *Sc. rufogularis* et *rufoniger*, Gray, apud Cantor (who expresses his suspicion that *Sc. redemitus*, Van der Boon, will prove to be another variety of the same). Two Malacca specimens ; one presented by R. W. G. Frith, Esq., the other procured by exchange : and a remarkable variety, according to Dr. Cantor, (nearly allied to that termed *rufoniger* by Mr. Gray,) with no white anterior to the shoulder, which is replaced by black mingled with rufous on the face, and by rufous on the neck and humerus : there is also a broad lateral band of greyish-white tips to the fur above the ordinary white lateral band ; the fur of the haunches is tipped with albescent-brown ; and the tail is clad with broadly white-tipped hairs, except at its extreme tip and base above. Dr. C. has a variety, from the Malayau peninsula, in some degree intermediate to this and to the ordinarily coloured Malayan individuals. The specimen here described is doubtless from the Archipelago, having been presented by the Batavian Society : Schinz states it to inhabit Bornéo and Malacca.

The following four races (and seemingly others) have the same claim to be considered local varieties of a single species, as have the various great Squirrels exemplified by Nos. 1, 2, 3, and 4 : but each would seem to be always true to its particular colouring (in its own proper habitat) ; and it is difficult to conceive that local causes should exercise so much influence in modifying the coloration, or that variable species should continue so very true to their colouring over a great extent of country as is the case with the several races under consideration.

6. *Sc. hippurus*, Is. Geoff. : *Sc. rufogaster*, and probably *Sc. castaneovenstris*, Gray, *Ann. Mag. N. H.* 1842, p. 263. From the Malayan peninsula. Body above, from occiput to base of tail, fulvous-brown picked with black, continued a little way on the tail ; rest of the tail black : head, sides of neck, and limbs externally, grizzled dark ashy, *contrasting strongly* with the fulvous hue of the back : under-parts, and inside of limbs, deep rufo-ferruginous, and generally an admixture of the same upon the ears. Two specimens : one presented by R. W. G. Frith, Esq. ; the other procured by exchange.

7. *Sc. rufiventer* (?), Geoffroy :* *Sc. erythrogaster*, nobis, *J. A. S.* XI, 970 ; *Sc. hypopyrrhus* (?), Wagler, Schinz (No. 34). From northern Assam and Munneepore. Throughout dusky-ash above, picked with fulvous, nearly as upon the head and limbs of the preceding race : below deep rufo-ferruginous, as in the latter : hairs of the tail annulated black and fulvous, with long black tips occupying more and more of each hair to the end, where they become wholly black, and the terminal two-thirds of the tail appear to

* This was supposed to be N. American : but the species inhabiting N. America are now tolerably well known, especially since Dr. Bachman's researches ; and none corresponding with the description of *Sc. rufiventer* has been there discovered.

be thus almost wholly black externally. Specimen from Muuecpore, presented by Capt. C. S. Guthrie.*

8. *Sc. erythræus*, Pallas. From Lower Assam and Cherra Poonjee. Resembles the last, but is more fulvescent, and the sides of the neck and outside of the limbs tend to be a little more ashy than the rest, but not contrasting strongly (as in the Malayan race): terminal three-fourths of the tail of the same deep rufous as the under-parts, with a pale and sometimes whitish extreme tip. Ears also red. Two specimens from Cherra Poonjee, presented by F. Skipwith, Esq.; and two small young, from Assam, presented in spirit by Major Jenkins, and since stuffed; these latter have much black towards the base of the tail, especially underneath.

9. *Sc. Keraudrenii*, Lesson, *Cent. Zool.* pl. I.; *Sc. ferrugineus*, Cuv. (*M. S. ?*), apud Schinz. From Arracan and Pegu. Entirely of a deep rufous-ferruginous colour, rather darker above than below, the fur of the upper-parts somewhat glistening: toes of all the feet blackish, as in the three preceding; and the extreme tip of the tail yellowish-white. Two specimens from Arracan, presented by Capt. Phayre.†

10. *Sc. vittatus*, Raffles; *Sc. bivittatus*, Desmarest.‡ This retains the rufous belly of the preceding species, but the colour is weaker; there is also a rufous tip to the tail: the size is smaller, and a new feature of colouring presents itself in the two contiguous lateral stripes, the upper white and the lower black, which separate the grizzled colouring of the back from the rufous of the belly. It abounds in the Malayan peninsula, Sumatra, &c.; and numerous specimens have been presented to the Society, of which three are retained for the Museum.

11. *Sc. nigrovittatus*, Horsfield; *Sc. griseoventer*, Is. Geoffroy. This differs chiefly from the last in having the under-parts albescent greyish instead of rufous, and there is no rufous at the tip of the tail, but a little at its base underneath; terminal half of the tail obscurely ringed: the upper lateral stripe is tinged with fulvous; and there is a rufous tinge on the cheeks. Specimen from Malacca, presented by C. Hufnagle, Esq. Hab. also Java.

12. *Sc. atrodorsalis* (?), Gray, *Ann. Mag. N. H.* 1842, p. 263: Pl. XXXVII, fig. 2. Size of *Sc. vittatus*, with an exceedingly fine bushy tail. Upper-parts golden-fulvous grizzled with black; the former predominating, especially upon the head: a broad longitudinal deep black patch on the back and croup, commencing behind the shoulders, and becoming evanescent posteriorly: breast and under-parts light rufescent, deepening towards the tail, the hairs of which are black with long pale ferruginous (or rufous-isabelline) tips:

* Very close to this must be *Sc. pygerythrus*, Is. Geoff. (in the *Zoology of Belanger's Voyage*), "from the forests of Syriam in Pegu." Colour brown picked with fulvous above, below bright rufous, extending up the base of the median line of tail, which latter is coloured like the back and indistinctly annulated.—Specimen *a*, assigned to *Sc. erythræus* in Mr. Gray's catalogue of the mammalia in the British Museum, seems referrible to this.

† Specimen *b*, from Bhotan, assigned by Mr. Gray to *Sc. erythræus* (*Brit. Mus. Catal.*), is described to have the "tail-end black, top of the head bright rufous; throat grey, grizzled; belly duller red." His specimen *c* has the "tail-end, bright red:" India only being given as the locality. The bright rufous top of the head shows a gradation towards *Sc. Keraudrenii*.

‡ Prof. Schinz refers this to the subsequently described *Sc. flavimanns*, Is. Geoff. (in the *Zoology of M. Belanger's Voyage*): the latter is stated by M. Is. Geoffroy to be very closely allied to *Sc. vittatus*, but to be distinguished by having the upper surface of the feet, front and outside of the fore-arm, and above the muzzle, fulvous: tail not tipped with rufous, but unannulated to its extremity; and there is no white line along the flanks. Hab. Ceylon or Cochinchina,—in all probability the latter, rather than the former, locality.

whiskers long and white. Specimen presented by the Rev. J. Barbe, from the Tenasserim province of Ye.*

13. *Sc. chrysonotus*, nobis, n. s. (Pl. XXXVII, fig. 1): a dull-coloured specimen described in *J. A. S. X*, 920. Size of *Sc. Rafflesii*, or measuring about 20in. long, of which the tail is half, its hair reaching 2in. or 2½in. further. General colour grizzled fulvous above, the limbs and tail grizzled ashy (from each hair being annulated with black and pale fulvescent), with an abruptly defined black tip to the latter: under-parts and inside of limbs pale grizzled ashy: in bright specimens, the nape, shoulders, and upper-part of the back, are vivid light ferruginous or golden-fulvous, sometimes continued to the tail, more generally shading off gradually towards the rump, and in some but slightly developed even upon the nape and shoulders: whiskers long and black; and slight albeseent pencils to the ears, more or less developed. Common in the Tenasserim provinces. Five picked specimens, presented by the Rev. J. Barbe, and E. O'Riley, Esq., of Amherst.

14. *Sc. lokroides* (?), Hodgson, *J. A. S. V*, 232: *Sc. assamensis*, McClelland, apud Gray, who regards this as different from *Sc. lokroides* of Nepal; but Mr. Hodgson's description of the latter fully applies.† From examination of a very considerable number of specimens, collected at Darjeeling, different parts of Assam, Cherra Poonjee, Tipperah, and Arracan, I can perceive no diversity whatever, in those from different localities, unless it may be, perhaps, on the average, that the Himalayan specimens are somewhat more rufescent underneath; but every gradation is even here observable. Mr. Gray, however, extends the range of *Sc. assamensis* to Darjeeling; and I have seen no specimens from Nepal proper. It is nearly allied to the preceding species, but is smaller, with rarely a trace of the black tip to the tail, and the nape and shoulders are uniformly coloured with the rest of the upper-parts: the whole being more or less rufescent in different specimens, in a slight degree only; and sometimes when most so, the under-parts are most albeseent, or scarcely sullied. In some the tail is very rufescent underneath, on the median line nearly throughout its length. I retain for the Museum two Darjeeling specimens, presented by Mrs. Saxon and C. S. Bonnerie, Esq.; two from Assam, presented by Major Jenkins and W. C. Thorburn, Esq.; one (half grown), from Cherra Poonjee, presented by F. Skipwith, Esq.; and three from Arracan, presented by Capt. Phayre and Capt. Abbott.

14. *a*. In the collection of a native gentleman (who has obligingly favored me with the loan of the animal, for comparison with the various allied species), is a living specimen of a Squirrel, (pl. XXXVII, fig. 3,) habitat unknown, which differs from *Sc. lokroides* (? *v. assamensis*) in having the under-parts and inside of limbs deep ferruginous as in the next, except the throat and breast, passing along the median line of the belly, which parts are of a deep grizzled ash-colour without a tinge of rufous, and much of the same hue as the crown and exterior of the limbs and feet: the body and tail having a fulvescent tinge, but less strong than is usual in *Sc. lokroides*; and the tail being slightly black-tipped, but with pale ends to the hairs. The rufous of the under-parts does not extend underneath the tail. If this be considered distinct and new, it may bear the name *Sc. griseopectus*, nobis.

15. *Sc. lokriah* (?), Hodgson, *J. A. S. V*, 232: *Sc. subflaviventris*, Me-

* *Sc. atrodorsalis*, Gray, is assigned to Bhotan.—“Gray; middle of the back blackish, slightly grizzled; cheeks and whiskers yellowish; ears, chest, belly, and under side of limbs, dull rufous: tail blackish—hair with a broad black central band.” Not improbably a dull specimen of that above described, with the locality erroneous.

† Mr. Gray refers *Sc. griseoventer*, Is. Geoff. (Zoology of Belanger's Voyage), from Java, to *Sc. assamensis*, instead of to *Sc. nigrovittatus*, Horsfield, with which it agrees entirely.

Clelland, apud Gray, who considers it distinct from *Sc. lokriah* of Nepal; though again the original description of the latter fully applies. Nearly allied to the last, but more rufescent, and deeper ferruginous below; the tail more or less deeply ferruginous underneath or behind, where bordered on each side with black subterminal and pale extreme tips. Two specimens from Darjeeling, presented by Mrs. Oakes and the late Mr. Webb; one from Cherra Poonjee, presented by the late Dr. Griffith; and a small specimen from Arracan, and a bad skin of another, presented by Capt. Phayre,—both of these having the under-parts considerably paler than is usual in Darjeeling specimens, though occasionally the latter are equally pale. In Arracan this species inhabits a higher elevation than No. 14.

16. *Sc. tenuis*, Horsfield: *Sc. annulatus*, Desmoulins; *Sc. modestus*, S. Muller.* Nearly allied to the last, but smaller, and the under-parts dingy rufescent-whitish. Inhabits Java and Borneo. Specimen presented by the Batavian Society.

We now come to the group of small striped Squirrels, of which three sub-groups may be distinguished. The first of these has a median white line along the back.

17. *Sc. palmarum*, Lin.: *c. penicillatus*, Leach, *Zool. Misc.*, I, tab. 1. Mr. Gray refers the following species to this latter; but I am satisfied that he is incorrect in doing so: no mention is made by Dr. Leach of the rufous underneath the tail, which is so prominent a characteristic of *Sc. tristriatus*; the sides are said to be "pale yellowish," which applies to *palmarum* and not to *tristriatus*; and Dr. Leach's specimen was taken from a nest formed in a library at Madras, which (so far as I have seen of the habits of the two species) decides at once in favour of *palmarum*: I doubt much whether *Sc. tristriatus* ever enters buildings; whereas I have observed *Sc. palmarum* to abound in the town of Madras. The discrimination of the two species is undoubtedly due to the late accomplished Curator of the Zoological Society's Museum (now employed at the British Museum), and I have pleasure, therefore, in restoring to him the nomination of *Sc. tristriatus*, the more especially as Leach's figure of his (so called) *penicillatus* is execrable, and the character upon which it is separated from *Sc. palmarum* most unsatisfactory. Of these two nearly allied species, *Sc. palmarum* only is found on the alluvium of Lower Bengal, where, as also in the plains of Upper India, it is the only representative of this vast genus. The specimens I have had set up were obtained on the Society's premises.

18. *Sc. tristriatus*, Waterhouse, *Mag. N. H.* 1837, p. 496; *Proc. Zool. Soc.* 1839, p. 118. Two specimens set up, of many procured by myself in the Midnapore jungles; and a third, from Ceylon, presented by Dr. R. Templeton, of Colombo. It is remarkable that the voice of this little animal is most particularly unlike that of the preceding species; though, in both of them, the notes are pretty sure to be mistaken for the chirruping of birds, by persons unacquainted with the sound;† the voice of *Sc. tristriatus* first attracted my attention in the jungle, and I watched for it some time in the supposition that it was a bird I had not met with before. *Sc. palmarum* was found about equally common in the same situations: but I think the tendency of this is to approach human habitations, and of *Sc. tristriatus* to avoid them. The size and proportions of recent examples of these two species (examined together) are absolutely the same; but the diversity of voice, and

* *Sc. philippinensis*, Ogilby, *P. Z. S.* 1839, p. 117, would also seem to come very near.

† This chirruping voice would help to ally these small striped Squirrels to the equally striped *Tamias* subgroup, as exemplified by the Chipping Squirrel of N. America, *T. lysteri*.

that of habit as shown by one only of them extending its range to the Gange-tic delta, superadded to the slight though constant differences of colouring (ahke in *Sc. tristriatus* from the jungles N. W. of Midnapore to Ceylon), indicate the extreme caution necessary ere we conclude other allied races to be merely varieties of the same, from their general similarity of size and colouring.—N. B. The Palm Squirrel of Pennant's 'Quadrupeds' (II, 415), from Ceylon, with "an *obscure* pale yellow stripe on the middle of the back," &c., may perhaps prove to be a third allied species of this subgroup, and there may be others yet undiscriminated.

Other species have a *black* medial dorsal line, as the two next which are closely allied, and have conspicuous small white-tipped pencil-tufts to the ears.

19. *Sc. McClellandii*, Horsfield, *P. Z. S.* 1839, p. 152: *Sc. Pembertonii*, nobis, *J. A. S.* XI, 887. Inhabits Sikim, Bootan, and the hill ranges of Upper Assam. Two specimens from Darjeeling; presented by the late Mr. Webb and Mrs. Oakes. This diminutive species has a deep black median dorsal streak, and two much less conspicuous brown lateral streaks, divided from the former by dull pale streaks of the same breadth with the last, and beyond the lateral dark streak is one of an albescent-buff colour: tail margined behind nearly as in *Sc. lokriah*, or rufous subterminated with black, and tipped with brownish-buff.

20. *Sc. Barbei*, nobis, *n. s.* (Pl. XXXVI, fig. 3). Resembles the last in size and structure, but is much more vividly coloured. There are five distinct black bands, three of equal length and breadth, the outermost less developed; alternating with four rusty-whitish bands, of which the two outer are rather brighter than the two inner, and are continued forward to the moustaches, passing beneath the eye: under-parts and inside of limbs bright pale ferruginous: the tail margined behind as in the preceding species, or rufous, each hair subterminated with black, but tipped with *white*. Three specimens, from the Tenasserim province of Ye, presented by the Rev. J. Barbe.

The next would seem to form an analogous little subgroup with *Sc. insignis*, Horsf., of Sumatra and Java.

21. *Sc. sublineatus*, Waterhouse, *P. Z. S.* 1838, p. 19: *Sc. Delesserti*, Guérin, *Mag. Zool.* 1842, and *Zoologie du Voyage de M. Ad. Delessert*, where figured. Inhabits the Nilgherries. Specimen presented by T. C. Jerdon, Esq. This minute Squirrel has remarkably dense close fur (as described of *Sc. insignis*), of a dark grizzled olive-colour, tinged with tawney, and having three pale lines alternating with four dark ones on the back and croup; the outer dark lines narrower and somewhat less dark than the others. It has thus the median line pale, as in *Sc. palmarum* and *Sc. tristriatus*; whereas *Sc. insignis* is described to have the median line dark (but this, I suspect, needs confirmation): under-parts dull tawney: the tail grizzled dusky and ferruginous.

22. *Sc. vulgaris*, Lin. Specimens in summer and winter pelage, presented by Mr. Bartlett and by the Cornish Institution. Inhabits Europe and Northern Asia.

23. *Sc. hudsonius*, Pallas. N. America. Presented by Mr. Bartlett.

Finally, of the Marmots, we possess—

Arctomys bobae, Schreber: *Mus arctomys*, Pallas: *Arct. himalayanus* and *A. tibetanus*, Hodgson, *J. A. S.* X, 777, and XII, 409. Adult and young (not in good condition), the former presented by Capt. Huddleston, who brought it from Almorah; the latter procured near Darjeeling by the late Mr. Webb: and a living young one, now more than half grown, presented by G. A. Bushby, Esq., as noticed in p. 385 ante. This little animal continues in perfect health and vigour, and has only now (in the middle of July)

just put forth its shorter summer pelage. It does not appear to be in the least degree distressed by the temperature of Lower Bengal, but is, in general, merely kept away from direct sunshine during the heat of the day: and (as always with this genus) it is perfectly fearless and tame, but without distinguishing individuals. It makes a loud chattering eachinnation not unfrequently. At first, when turned loose, this Marmot used generally to collect as much grass as he could carry, and take it to the place where he was kept; but I have not observed him to do this of late, though he probably again will by and bye.

I will now consider the range of distribution of our Indian true *Sciuri*, and those inhabiting the eastern side of the Bay of Bengal, as far southward as the Straits of Malacca.

As with the Flying Squirrels, the group of true *Sciuri* is not much developed in India proper. Thus, in the peninsula and Ceylon, only five species are known, all pertaining to subgroups peculiar to this part of the world,—viz. that of the gigantic Squirrels (the races or species of which are brought together by some Zoologists as varieties only of *Sc. maximus*, Schreber), and that of the diminutive so called Palm Squirrels.* Of the latter, *Sc. palmarum* would seem to be diffused generally over the plains, where it is the only species met with; as in the Gangetic delta, beyond which it does not pass eastward (that I have been able to learn), nor into Assam, while to the north it ranges to the foot of the hill country, and in a N. W. direction till checked by the great deserts.† Southward, it is said to inhabit Ceylon, and to abound on the table-land of the Deccan: while in more undulating ground it is found together with the next species. *Sc. tristriatus* takes the place of *Sc. palmarum* in more hilly districts, to a moderate elevation; abounding along the ranges of ghâts on either coast of the peninsula, also in Ceylon, and extending northward to the borders of the Gangetic delta, and thence westward into central India: it probably also occurs on the Rajmahl and Monghyr hills in Bengal, if not also in the sub-Himalayan sâl forest; but further observations are required to trace satisfactorily its geographic range, as it has been very generally confounded with *Sc. palmarum*. The little *Sc. trilineatus* is exclusively a hill species, confined to a more elevated range of country; having been hitherto observed only in the Nilgherries: but a representative of it (if not the identical species) might be looked for in Ceylon, if not also in the Mahabuleishwar. Of the two great Squirrels, *Sc. purpureus* seems to be generally diffused, or nearly so, throughout the hill jungles of the peninsula; except perhaps in the extreme south and in Ceylon, where *Sc. macrourus* inhabits and probably replaces it. The *Sc. dschinschicus*, Gm. (v. *ginginianus*, Shaw), founded on *P'Furcil de Gingi* of Sonnerat, and probably the same with *Sc. alborittatus*, Desmarest,—a species apparently allied to *Sc. plantani* of Sumatra and Java,—is greatly in need of confirmation as an inhabitant of India.

Passing now to the Himalaya, I have no information respecting the species (if any) inhabiting the N. W., or Alpine Punjab, or even to the westward of Nepal; but to the S. E. (as in eastern Nepal, Sikim, Bootan), there is the large black Squirrel, *Sc. bicolor* apud nos, which spreads thence to the hill ranges of Assam, and those of Munceepore, Sylhet, Arracan, Tenasserim,

* I cannot say that I have absolutely never seen *Sc. palmarum* upon a palm, but it assuredly does not resort much to the *Palmacea*. These diminutive striped Squirrels come very much on the ground, as their affinities with the Ground Squirrels (*Tamias*) would intimate; and are about equally terrestrial and arboreal: they are continually seen, with feathery tail upraised, running about and crossing one's path on the ground, but immediately retreat to a tree upon alarm.

† Vide *J. A. S.* XV., 168.

&c., at least as far as the Straits of Malacca: also, in Nepal, the allied *Sc. lokriah* and *Sc. lokroides*, of the size of *Sc. vulgaris*; which a little further east (as in Sikim) would be represented, according to Mr. Gray, respectively by *Sc. subflaviventris* and *Sc. ussamiensis* of McClelland—though the latter certainly accord with the descriptions of *Sc. lokriah* and *Sc. lokroides*, and I cannot but very strongly suspect them to be the same. Both these Sikim species continue their range to the Assamese mountains, and with them a diminutive striped Squirrel—*Sc. McClellandii*, which probably inhabits a greater elevation.*

In Bootan, besides the last four, there should be, according to Mr. Gray, *Sc. erythræus* (var., with "top of the head bright rufous"), *Sc. caniceps*,† and *Sc. atrodorsalis*; but it is not improbable that the localities of the two latter are given erroneously,—the last seeming to be my Tenasserim species (No. 12), referred to the same with a mark of doubt.

Upon the hill ranges of Assam, the same species occur as in Bootan—at least the four that range thence from Sikim: while *Sc. rufiventer* (? with black tail) abounds to the northward, and in the hills surrounding the valley of Munneepore; the very doubtfully distinct *Sc. erythræus* (with rufous tail) representing it southward, and about Cherra Poonjee (north of Sylhet).

In Sylhet, Tipperah, and Arracan, *Sc. lokroides* (? v. *assamiensis*) continues very abundant; and probably also *Sc. lokriah* (? v. *subflaviventris*) at a greater elevation, as certainly in Arracan: and in the last named province the entirely red *Sc. Keraudrenii* abundantly replaces *Sc. erythræus* of Lower Assam and Cherra Poonjee, and has the same claim with *Sc. rufiventer* (?) to be considered a mere variety of *Sc. erythræus*. In Pegu, there is again the *Sc. pygerythrus*, Is. Geoff., additional to *Keraudrenii* (though probably not in the same localities), which also would seem to exhibit but another variation of the same specific (?) type. *Sc. bicolor*, *Sc. Keraudrenii*, *Sc. lokriah* (?), and *Sc. lokroides* (?), are the only true Squirrels which I know to inhabit Arracan.

Proceeding further south, in the Tenasserim provinces we only recognise the large *Sc. bicolor*, among the preceding species: and there is a diminutive striped Squirrel, *Sc. Barbei*, which is nearly allied to *Sc. McClellandii* of Sikim, Bootan, and N. Assam. The only others I know are *Sc. chrysonotus*, which seems to be very common, and may be said to represent *Sc. lokroides* (?) of Arracan, &c.,—and *Sc. atrodorsalis* (?), of which I have seen only a single specimen: but I doubt not that others inhabit the provinces; and we might specially look for a representative of the *erythræus* type—perhaps *Sc. pygerythrus*, Is. Geoffroy.

In the Malayan peninsula, there appears again to be a complete change in the *Sciuridæ*, excepting only the great *Sc. bicolor*, which continues identically the same; though exhibiting here a remarkable pale variety, in addition to the ordinary dark race. The *erythræus* group, however, finds its representative in *Sc. hippurus*: and another group with conspicuous stripes on the flanks, very characteristic of the Malay countries, is exemplified by *Sc. vittatus* and *Sc. nigrovittatus*. The beautiful *Sc. Rafflesii* is common southward: and there is also the very curious *Tupaia*-like *Sc. laticaudatus* (vide XV, 251). Dr. Cantor adds *Sc. tenuis*, Horsfield, which I have seen only from Java; and it is very probable that *Sc. insignis* of Sumatra and Java inhabits the mountains: *Sc. plantani* should be likewise sought for. The habitat "India," attached by Mr. Gray to this last named species, as

* *Sc. lokriah*, *Sc. lokroides*, and *Sc. McClellandii*, are erroneously assigned by Prof. Schumz to Bengal.

† "Pale grey, grizzled. back yellowish; beneath, paler grey: tail long, grey, black-varied, ringed, hair with three broad black bands." *Ann. Mag. N. H.* 1842, p. 263.

also to *Sc. Rafflesii* and *Sc. rufoniger* (*Rafflesii*, var.?), may be safely regarded as certainly erroneous.

The Society's present collection of *Sciuridæ* comprises 88 specimens, of 35 (provisionally assumed) species, for the most part—with very few exceptions—select and in excellent condition. Of these, 23 belong to the sub-group of Flying Squirrels, 3 (inclusive of the living Marmot) to that of Marmots, and the remainder to the very extensive genus *Sciurus*. In the "Catalogue of the Mammalia in the Museum of the Asiatic Society," published in *J. A. S. X*, 660 *et seq.* (August, 1841), not a single specimen is enumerated; but there were 6 in the Museum when I took charge of it, in the following month, of which one only (*Sciuropterus fimbriatus*) now remains, the rest (*Sciuropterus alboniger*, *Sciurus purpureus*, *Sc. vittatus*, *Sc. lokriah*?, and *Sc. McClellandii*.) having since been replaced by better specimens.

Our present desiderata, among the Flying Squirrels, are those of Ceylon, *Sciuropterus fuscocapillus* of S. India, *Sc. Horsfieldii*, *Sc. genibarbis*, and *Pteromys punctatus*, of the Malayan peninsula, with the species generally of the Archipelago, and series of the large *Pteromydes* of the Himalaya—particularly of its N. W. ranges—that might aid in determining the specific types. Of the true *Sciuri*, a series of *Sc. macrourus* of Travancore and Ceylon, illustrative of the variation to which this race is subject; and the small striped species generally of S. India and Ceylon, including even the common *Sc. palmarum*. Should such a species as *Sc. dschinschicus* or *albovittatus* occur, (dull-greyish or fulvescent, with a white or yellowish-white stripe on each side, and the size a little exceeding that of an English Squirrel,) specimens would be particularly acceptable; and fine specimens are desirable of all the small or middle-sized species inhabiting Arracan and the Tenasserim provinces; and the species generally of the Archipelago, with the curious *Sc. laticaudatus* of the Malayan peninsula. Indeed, of those we already have, more specimens of *Sc. nigrovittatus* of the last named locality, and of *Sc. trilineatus* of the Nilgherries. Also *Sc. lokriah* and *Sc. lokroides* from Nepal proper: any Himalayan species found to the westward of Nepal; and the species before referred to, as stated by Mr. Gray to inhabit Bootan. Of the Himalayan and Tibetan Marmots, good specimens are extremely acceptable: and of all the Flying Squirrels, without exception, good specimens are generally acceptable for transmission to the Hon'ble Company's Museum in London, and to various other scientific Institutions.

Addendum to first Report.

In p. 864 ante, I took occasion to point out that my *Rimator malacoptilus*, p. 155 ante (February), had been redescribed by Mr. G. R. Gray from the same specimen as *Caulodromus Gracei*, in the *An. Mag. N. H.* for May of the present year: it now again appears, as a new genus and species, by the name *Merva Jerdonii*, Hodgson, in the 'Calcutta Journal of Natural History' for April, but published in the middle of August: the paper, however, bearing date of December 1846. But the latter is of no recognised importance; and my description of this bird had indeed been awaiting an opportunity for publication since 1845, when Mr. Grace was in Calcutta. I certainly did my utmost to prevent any *doubles emplois* with Mr. Grace's specimens; having sat up till late at night in labelling his whole collection, as that gentleman will remember: and as he well knew that I had pointed out the *Rimator* as new, and with his permission, named and took a description of it for publication, Mr. Gray's synonyme might at least have been spared. Whether my published description of this curious little bird is sufficiently perspicuous and intelligible, must be left for others to judge: but it is greatly to be regretted that these synonymes should thus unnecessarily accumulate.

A question of priority of publication fairly arises, when a Journal falls into arrear, so that its No. for a particular month is not actually published for several months afterwards. Thus, in No. 29 of the *Cal. Journ. N. H.*, dated April, but published in August, there are papers bearing the author's date of May! Which, therefore, in *doubles emplois* cases is to be considered the date of publication of a particular name? Surely not April, for an article written in May! The obviously correct mode is to have the actual date of publication printed on each No. of a periodical, as is now done on the cover of the Society's Journal: though as the latter is generally thrown away when the volumes are bound up, a more permanent place of record is desirable.

In *Archibuteo cryptogenys*, Hodgson, published in the same No. of the *Cal. Journ. N. H.*, I think I recognise my *A. hemiptilopus*, *J. A. S. XV*, p. 1. *Butaquila strophiota*, II., is, I very strongly suspect, the *Hieraëtus pennatus* (v. *Spizaëtus milreoides* of Jerdon), which is not rare in Lower Bengal during the cold season. With reference to the remarks on the other Indian Buzards, it may further be mentioned that besides *Buteo rufinus* (v. *canescens*, v. *longipes*),—which is common in Lower Bengal above the tideway of the rivers,—Mr. Jerdon has described a *B. rufiventer* in the supplement to his catalogue of the birds of peninsular India, *Madr. Journ. XIII*, 165; and that my *B. pygmaeus* (nec *nanns*), *J. A. S. XIV*, 177, has hitherto been observed only on the eastern side of the Bay of Bengal.

Felis Ogilbii, Hodgson, (*ibid.* p. 44,) would appear to be the same small Cat which Mr. Gray has named *F. Charltoni* (from a Darjeeling specimen), as noticed in note to p. 865 ante, and which I consider to be a mere variety of *F. bengalensis* (v. *nipalensis*, &c. &c.)—*F. macrocelis* (v. *macroceloides*), perfectly identical with the Sikim animal, inhabits the mountains of Arracan, as shown by a skin in the Society's Museum: and as several Malayan animals extend their range to Arracan, and as there is considerable diversity in the ground colouring and general appearance of two Sikim specimens of this Cat in the Society's collection, I doubt exceedingly whether any sufficient diversity has been observed between the Sikim, Tibet, and Arracan specimens of it, on the one hand, and the Sumatran specimens on the other, to warrant their being assumed to be distinct, however remarkable and unusual this geographic range.

Lastly, respecting the alleged five species of four-horned Antelope, also noticed in the same No. of the *C. J. N. H.*, it appears to me that they may be safely again reduced to two, viz. *Tetraceros quadricornis*, v. *chickera*, and *T. subquadricornis*, Elliot. *T. iodes*, H., as described, applies exactly to the Bengal animal, in every particular; and among the fine series of specimens in the Society's Museum, there is one of a young male (that I had alive) with the fore and hind horns of the same relative size as in Hardwicke's figure (*Lin. Tr. XIV*, tab. 15), but the position of the horns in that figure is erroneous, as shown by reference to the attached description, and I was informed that the skeleton in the Museum of the Royal College of Surgeons, London, was that of the identical individual figured by Gen. Hardwicke, the horns in this being placed as usual in the Bengal animal. When at Midnapore, last cold season, I saw together, in the possession of O. W. Malet, Esq., a pair of the common *T. quadricornis*, and a pair of what I considered to be Mr. Elliot's *T. subquadricornis*; both (as I understood) from the jungles at no great distance from that station, where I myself obtained a fawn of the former species: and this adds to the probability of both species being likewise found in the sub-Himalayan sal forest: indeed, they both also occur in Southern India, for Mr. Elliot some time ago sent me for recognition a skin of *T. quadricornis* procured in the Wynaad.

As for the affinities of these little Antelopes, they are nearly allied to the *Tragelaphi*, Ham. Smith, of Africa (or the *Boschbok*, Guib. or Harnessed Antelope, and their congeners); and the former bear exactly the same relation to the Nilghai of India, which the latter do to the Koodoos (*Strepsiceros*) of Africa. The ringed markings of the feet occur throughout the whole series, more or less distinctly: and the posterior horns of *Tetraceros* resemble those of *Portax*, or the Nilghai; and, as in the latter, frequently recline backward in captive-reared individuals, instead of taking the normal curve upward. The females of all are hornless: and I even doubt if there be any good generic character to distinguish the females of *Tetraceros* from those of *Tragelaphus*; though the latter are somewhat heavier and more Hog Deer like in form, especially the *Boschbok* of the Cape. Both groups are monagamous; and they closely resemble in habits, manners, and gait.

Aug. 10, 1847.

E. BLYTH.

NOTE.—In p. 779 ante, I referred the *Fringilla petronia*, Lin., to Mr. Hodgson's genus *Gymnoris*: but I find that the latter is synonymous with *Petronia*, (Ray) Bonap.; and the species is designated *P. rupestris* by the Prince of Canino. Gmelin, however, had previously designated it *Fringilla stulta*, as shown by Mr. H. E. Strickland; and the latter name will accordingly stand as the specific appellation. The group differs from the closely allied genus *Passer* in having a non-bulging, perfectly conical, bill, more or less thick; also in coloration, which in both sexes approaches that of the females of *Passer*, with constantly a yellow spot in front of the neck, weaker in the females: and, I much suspect, in their exclusively arboreal habits; whereas all the true Sparrows resort (more or less) to buildings.—The species known to me are 1, *P. stulta*, (Gm.)—2, *P. superciliaris*, A. Hay, nobis, XIV, 553—and 3, *P. flavicollis*, (Franklin.) The second is nearly allied to the first, but with the more slender bill of the third.

With respect to *Passer hispaniolensis* and *Sturnus unicolor*, two species common to Afghanistan and N. Africa (p. 779 ante), it is remarkable that both likewise inhabit Sardinia. This island has long been known as a locality for the latter species; and Bonelli states that the former is the only Sparrow found in Sardinia. According to Capt. Widdrington, neither *P. hispaniolensis* nor *P. cisalpinus* inhabits Spain. The former was, I believe, named from a caged specimen obtained at Gibraltar.

To the synonymes of *Pteromys albiventer*, p. 865 ante, add *Pt. inornatus*, Is. Geoff., figured in Jacquemont's Atlas.—E. B.

Report of the Curator Museum of Economic Geology, for the months of June and July, 1847.

Economic Geology.—We have to report for these months several useful additions to our Museum which are—

12 large specimens of Marble from Mr. Weaver, and 10 smaller ones from Messrs. Currie and Co.

• Also a specimen of marble from the new Christian Church at Alexandria.

Dr. Dodd of the H. C. Mint has favoured us with 20 specimens, some of which are rare, others will fill up blanks in our Mineralogical Series, and some, though duplicates, are much finer specimens than we possess. We shall I trust be able on our side to add to Dr. Dodd's collections in exchange for some of these.

Our active contributor Captain Sherwill, of the Dinapore Survey, sent down to me some specimens for identification, which I examined and replied to him.

Geology and Mineralogy.—I have looked over and chemically examined some of the specimens presented by Captain Kittoe in April. Many are common, but a few are worth notice.

1. A very good specimen of Asparagus-green Tourmaline, with small crystals of red Tourmaline amongst it; the green a new mineral for India, as far as I recollect. We have pale apple-green, white and blue tourmalines, from America, and the Alps, in our collection; but none of this colour, which is rarer than many other sorts. The red ones, though minute, are perfect Rubellites.

Our specimen is evidently from a vein and weathered, so that probably larger crystals may be found there.

Before the blowpipe it becomes by long heating opaque and slaggy on the edges, though still preserving its green colour, so that it has the appearance of a small lump of copper slag or Uranium ore under the magnifier.

The hardness is 6.7, and the specific gravity 3.3.

2. A remarkable apple-green quartz rock with bands of rose-coloured felspar and transparent quartz running through it. This is, both mineralogically and geologically curious; for, as will be seen afterwards, it is the rare case of pure silicate of iron so often met with in sand, and disseminated in other rocks and minerals, forming nearly a rock by itself.

Another specimen of the same kind is mixed with grey and white quartz and minute crystals of Iron pyrites. This specimen was carefully examined, as the pyrites might be auriferous, but nothing but Iron with slight traces of arsenic was detected. The pure green rock also, when pulverized, yielded nothing but iron and silica, both via *humida* and by the blowpipe, to which it gave with borax the usual green glass.

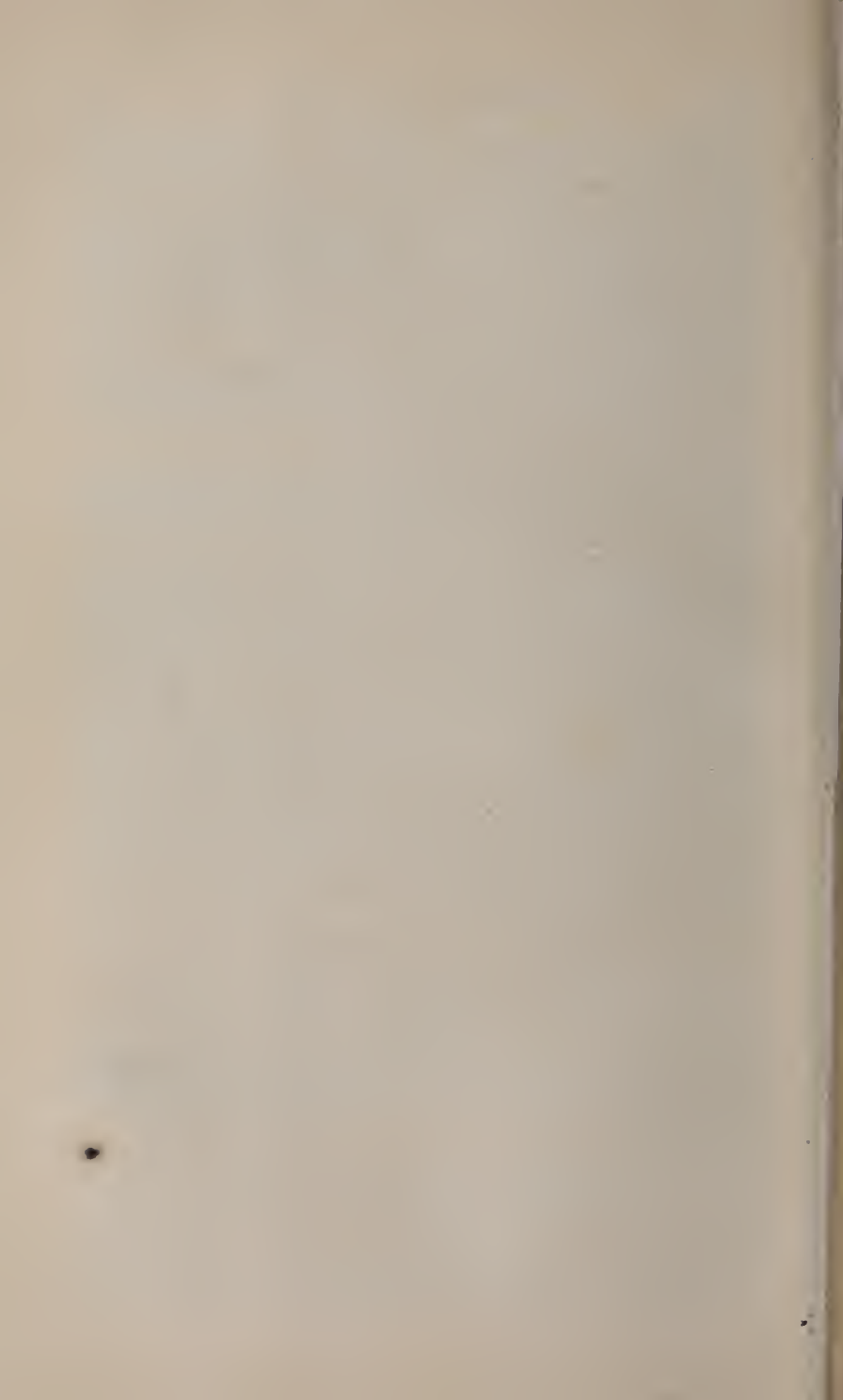
3. A specimen, sent, I presume, as the Plumbago mentioned with a note of interrogation at p. 492, is not Plumbago, but a rolled specimen of magnetic Iron ore, mixed with silvery mica and quartz; forming together a remarkable light grey diallage-looking rock with a strong pearly lustre in certain lights. It is highly magnetic but infusible before the blowpipe, which only renders it slightly slaggy at the edges. It dissolves largely in Hydrochloric acid but gives only Iron to re-agents. We have a specimen which approaches to this from the iron mines of Ajmeer, but it is certainly not common, and if a definite compound, should form at least a separate variety, for the purer sorts might be termed Diallage iron-ore.

4. A fine specimen of flesh-coloured felspar, of which we had but a very small piece in our collection.

5.—A good specimen of granular and fibrous Tremolite.

We have no localities I regret to say, for these minerals. I will write to Captain Kittoe to learn if he can recollect the place where he collected them.

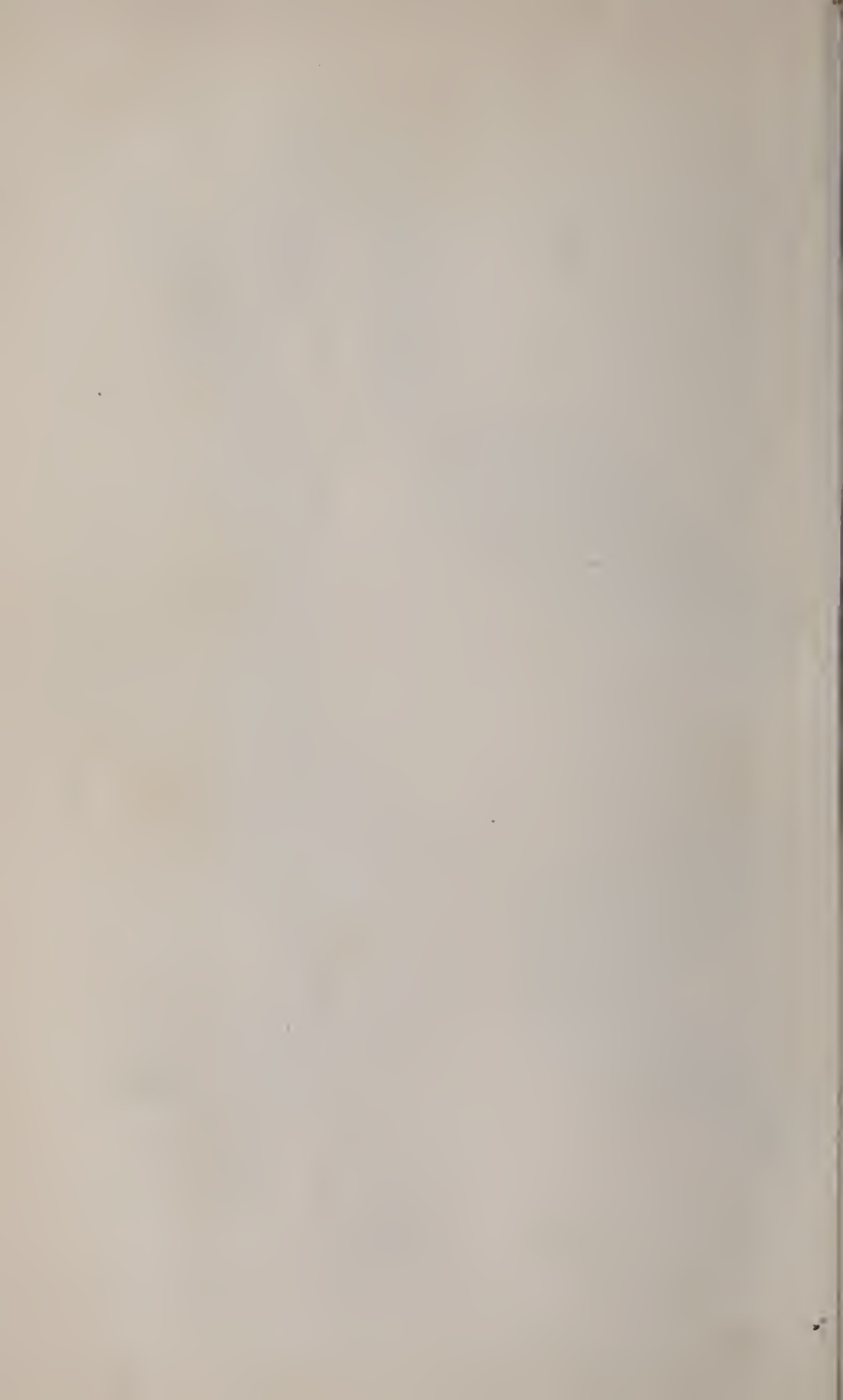
Captain Sherwill, of the Dinapore Survey, as already mentioned, has sent a few specimens for examination: amongst them are a remarkable variety of massive Asbestos, much resembling lithomage in appearance, but of which the fibrous structure when crushed and its behaviour before the blowpipe place it in the asbestos family: specimens of the same altered by heat have also been sent.





1. *SCIURUS chrysocentrus*, n. s. 2. *SC. alrodorsalis* ? Gray, N^o 12.

3. *SC. griseopectus*, N^o 14½. Relative Size.





THE GREATER FLORICAN OF THE TARAI



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